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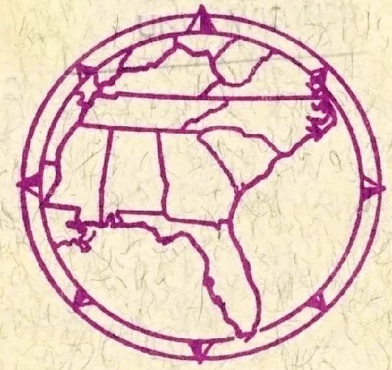

NEAL G. LINEBACK
Guest Editor

The SOUTHEASTERN GEOGRAPHER is a biannual publication of the Southeastern Division of the Association of American Geographers. The journal publishes research papers of general topical or methodological interest as well as those concerned with the South.

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SOUTHEASTERN GEOGRAPHER

Volume XIV, Number 2 November, 1974

AN ISSUE DEVOTED TO MANUFACTURING IN THE SOUTH

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SUBSCRIPTION INFORMATION

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The journal invites submittal of manuscripts of general interest to readers. While papers concerned with the southeastern U. S. are particularly appropriate for this journal, research papers of general interest, whatever the setting, are welcomed. Authorship is not restricted to those in the Southeast.

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ABSTRACTS

All articles appearing in the *Southeastern Geographer* are abstracted for inclusion in *Geographical Abstracts*, a four-series international journal published in England. Authors of accepted papers are asked to prepare a 150-200 word abstract.

INTRODUCTION

This issue of the *Southeastern Geographer*, "Manufacturing in the South," is envisioned by the guest editor as providing a multifaceted view of industry in the South. Beginning with a brief history of manufacturing, it carries through with macro geographic analyses and concludes with micro studies of industries and areas.

Perceptions of the South as an underdeveloped and backward agrarian society were dispelled long ago. The "New South" has become recognized as an industrial frontier with new markets, compatible labor, and an expanding manufacturing base.

Small towns and villages, scattered at considerable distances from the traditional locations of industry, the large cities, are now situated on an expanded network of rural highways and are attracting large numbers of truck transport-oriented industries. Freed from the need for rail sites, many industries have found that rural sites offer certain amenities frequently not found in urban sites, such as economical, non-unionized labor, inexpensive land, and positive community attitudes. Thus, the pattern of Southern industry is changing.

Planned industrial parks, abundant power, capital for investment, and other financial assistance have helped attract industries to the region. But increased regional markets which have accompanied growth in manufacturing have had a substantial effect on the industrial growth rate of the South during the '60's and '70's.

This issue of the *Southeastern Geographer* incorporates many of the characteristics mentioned above. Truman Hartshorn was asked to write a prologue. His comments are perceptive and timely.

James O. Wheeler's article, "Regional Manufacturing Structure in the Southeastern United States, 1973," analyzes the broad geographic distributions of manufacturing, the industrial mix, and the role of metropolitan areas in the manufacturing characteristics and composition.

William A. Rabiega's and Roland W. Wood's article, "Manufacturing Diffusion as a Growth Point Process in the Southeast," statistically analyzes the role of growth points in the present geographic patterns of industry in the region.

Paul F. Rizza's article, "Functional Components of the Ferrous Scrap Industry in a Selected Portion of the Southeastern United States," discusses an increasingly important segment of heavy industry in the South. The collection, assemblage, separation, transporting, and marketing of scrap are all discussed for an industry which may supply as much as one half of the raw material for steel manufacturers.

Merle C. Prunty's and Carl F. Ojala's "Locational Stability Factors in the Men's Apparel Industry in the Southeast" is clearly a contemporary

article, examining cost advantages, raw materials assemblages, linkages, transport costs, inertia effects, and Federal regulations.

Daniel Good, in "Industrial Park Occupancy and Community Size in East Tennessee," relates the function of parks, ownership types, industrial types, and community sizes. His findings are particularly relevant to groups considering building industrial parks in small towns and villages.

The article by John R. McGregor and Robert H. Maxey, "The Dalton, Georgia, Tufted Textile Concentration," considers a little studied and highly concentrated industry which represents a classic example of industrial inertia.

It is hoped that, herein, as many questions are asked as are answered. Geographic research in manufacturing, although not new, holds great promise for young and innovative scholars who are unencumbered by traditional methodologies.

Neal G. Lineback
Guest Editor

PROLOGUE

*Truman A. Hartshorn**

Industrial development in the South is primarily a post-Civil War phenomenon. *(1)* The early industries, predominantly resource oriented, have sustained their lead, and this has led to a number of paradoxes which characterize Southern manufacturing. By national standards, the region remains largely undeveloped. But industry is prospering; the future promises a stronger profile as the trend toward diversification gains momentum and the region's market share of industry becomes more balanced.

TRADITIONAL INDUSTRIAL STRUCTURE. Manufacturing became the dominant activity in the South in 1958, supplanting agriculture, the traditional leader. *(2)* This late takeover was not due to a sluggish manufacturing sector, as employment increases have been consistently strong since WW II in the South. *(3)* Rather the significance of this timing lies in the overwhelming grip that agricultural pursuits have traditionally had on the South. *(4)* Moreover, farming in the South was very traditional until recent times. Mechanization was slow, units were small compared to national standards, and farms were not prone to new developments, as the majority were devoted to crops (cotton, tobacco) that were themselves depressed. Thus, when farming began to decline, the fall was precipitous. From Maryland to Texas, the 16 state South released three million workers in the 1940-1970 period. *(5)* The largely unskilled work force that left the farm was fortunate in that employment was readily available in expanding textile, timber, apparel, and food processing activities. *(6)*

These industries were the traditional leaders in the South. And manufacturing expansion in the South has been synonymous with further growth of these activities, rather than a broadening of the mix. *(7)* Nevertheless, employment gains have been impressive. The South has witnessed stronger expansion than national rates in non-agricultural employment. *(8)* Part of this strength is due to the robust nature of services, but it is also explained by the strength of the commodity-producing sector. Resource-oriented industries which are labor intensive, low paying, and small scale endeavors, are the big employers of the region. Half of the states of the 16 state South had food, textiles, or apparel as the leading industry in 1968, according to the Bureau of Labor Statistics data. Another three states had primary metals as their major employer, and even in the five states where employment in other sectors led, food, textiles, or apparel industries was the second leading employer. *(9)*

*Dr. Hartshorn is an associate professor of geography at Georgia State University. The guest editor requested that Dr. Hartshorn write this prologue.

In the most impacted regions of the South, Appalachia, the Atlantic Coastal Plain, and Four Corners area of Oklahoma, Arkansas, and Missouri where per capita incomes are the lowest, the dominance of these traditional industries is most pronounced. *(10)* These areas along with the rest of the South, even though largely rural in character, are attractive locations for these unskilled, low wage paying industries. *(11)* The employment gains in such rural areas in the South in fact overshadowed work opportunity gains in larger urban markets in the 1960's. With relatively little capital investment many jobs have been produced. The TVA area is a case in point. *(12)* In the 1959-68 period 5,000 new plants were constructed in this region, and a net increase of 245,000 manufacturing jobs was realized. A quarter of the capital investment led to the creation of half of the new jobs which were in lumber, furniture, textiles, apparel, and leather activities. But half of the investment and 14 percent of the jobs were in primary metals, chemicals, and paper, taking advantage of electric energy.

The dominance of industry in smaller urban places in North Carolina is particularly pronounced. Stuart has characterized the greater Charlotte tributary area, called Metrolina, as a dispersed urban region because of the urban-type employment profile of an otherwise largely rural region. *(13)* And it is also significant that the third largest industrial market in the South, after Baltimore and Atlanta, is the Greensboro-Winston-Salem-High Point region of the Piedmont Crescent. Although individually not large in population, these cities are great manufacturing centers for textiles and furniture and partially explain why North Carolina leads the region in value added by manufacture.

In other states, particularly Georgia, Florida, and Texas, the urban centers dominate manufacturing activity. *(14)* Over half the number of plants in Georgia, for example, are located in the Atlanta metropolitan area. *(15)* The greater Miami-Hollywood area of Florida is the leading manufacturing region in that state. *(16)* But more significantly, the most industrialized states in the South are the most traditional in their business mix. *(17)* They have the lowest pay structures as well. South Carolina, North Carolina, and Tennessee are the most industrialized. This is a paradox that is not easily dismissed. The severity of the problem is more evident when one examines per capita income figures and value added data. For example, even though the relative importance of manufacturing employment in the South and the nation is similar (25 percent of total employment), value added figures for the South are only 25 percent of total U. S. levels. *(18)* And in South Carolina, fully 68 percent of the labor force is engaged in blue collar work. Moreover, the least industrialized states of the South (Florida, Louisiana, Oklahoma) have the highest manufacturing wage rates. These states have more heavily capitalized industry (electrical, petro-chemical, and machinery firms),

and they are also the most diversified. For example, the northeast portion of Florida centered on Jacksonville produces a wide variety of products from ships to chemicals and nuclear power plants. *(19)* And while higher technology industry does exist in the South, it employs only a small portion of the work force. In short, the South is damned by its specialization in slow growth sectors. *(20)*

Industries growing rapidly nationally have not been expanding significantly in the South. But the rate of growth in the South continues to increase. Part of the momentum is explained by the lure of the Southern market which is the largest outside the Northeast and West. Some of this growth represents catch-up, as discriminatory freight rates formerly made it more expensive to ship manufactured goods outside the region than to import the same goods from the North. *(21)* This situation favored importing goods rather than building up an industrial base in the region. Market-share/input supply analyses indeed indicate that the South is becoming more self-sufficient in more high technology industries. *(22)* And the South has shown less sensitivity than the nation in recent years to economic downturns. *(23)* Average expansion periods have been longer than for the rest of the country and average durations of contractions are shorter. However, incomes are a bit more unstable than employment in the area. This relates to the facts that the proportion of skilled workers is low, and unions are weaker in the South than they are nationally.

DIVERSIFICATION. Diversification remains elusive for the South, where 38 percent of its jobs remain confined to textiles, apparel, and food processing. Research and development activity is being encouraged. The Research Triangle Park of North Carolina is the best evidence of this thrust. *(24)* Five of the largest cities in the deep South (Houston, Dallas, Atlanta, New Orleans and Miami) are all touting their cities as good places for corporate headquarters as well as for production facilities. *(25)* Indeed, foreign investors also sense the potential of the South. *(26)* Both Japanese and West German investments in new plants are accelerating. So also is the growth of many leisure-oriented industries (boats, recreation equipment), prefabricated housing and mobile homes as well as the electronics and nuclear industries and other less glamorous activities like tufted carpets and caskets. *(27)* Many so-called footloose firms are now finding the skilled labor force sufficient in the South for them to locate in the region and take advantage of many of the amenities (climate, lower cost of living, etc.). Federal investments in the past in various military and space programs have also provided incentive for aerospace activity, particularly in Florida and Texas.

The growth of branch plant locations is particularly pronounced in the South. This is a characteristic part of regional growth in all underdeveloped areas according to some analysts. *(28)* The large reservoir of

underutilized material and human resources in the area also provides increasing incentives for Southern locations as schools are now producing a more skilled labor pool.

* * *

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REGIONAL MANUFACTURING STRUCTURE IN THE SOUTHEASTERN UNITED STATES, 1973

*James O. Wheeler**

There have been a number of studies in recent years dealing with the location of manufacturing activities in the southeastern United States, a region that has been growing at a rate above the national average for the past several decades. *(1)* The majority of these studies have focused on the reasons for firms locating in the South or on the role of a particular locational factor, such as wage rates or water. *(2)* Although no definitive statement exists on the precise role or relative importance of various locational factors responsible for the growth of Southern industry, the major factors have been identified: national markets, regional markets, resource availability, labor advantages (wage rate and labor surplus), industrial linkages, and climatic suitability. However, analysis of these locational factors has only obliquely shed light on the regional structure of manufacturing in the South.

Generalizations about the structure of Southern manufacturing include its lack of a diversified industrial base and the dominance of low wage, low value-added, low capital investment, and slow growth industries. *(3)* Singled out for special analysis has been the rural locational preference of Southern manufacturers, which varies, according to research by Lonsdale and Browning, from a high of 61 percent rural firms in South Carolina to a low of 24 percent in Tennessee. *(4)* Their survey of nearly 2,000 manufacturing firms in 1969 established the Southeast as distinct from most of the rest of the country in having a high proportion of rural industry.

Other research has examined the South in the context of location theory and regional development theory. *(5)* This work has drawn upon two somewhat different theoretical frameworks, the first viewing industrial growth and locational change largely as an internal process within a region, while the second attributes industrialization to an export base through interregional (or international) trade theory. *(6)* Both purport to explain the magnitude and regional structure of manufacturing. The first approach, stemming largely from Hoover and from Perroux, emphasizes the sequence or stages of development. *(7)* The theories relate structural change in the region to technological progress and explicitly address the question of the location of industry within the region. Hoover's work, following from classical locational theory conceived at

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a macroscale, incorporated technological change; many spin-offs and derivatives have been developed. *(8)* Perroux has initiated a large body of research on the growth pole concept within a region, and Darwent has examined the concept from an explicitly geographical point of view. *(9)* The second analytic framework, the external stimulus to regional growth, has been examined by a number of writers, including North, but it has been little applied in the context of the South. *(10)* Needless to say, the interregional trade theory and the intraregional, macro locational theory share several points in common.

PURPOSE AND DATA. The purpose of this research is to describe the regional structure of manufacturing in 12 Southeastern states and their major metropolitan areas, with focus upon the largest firms which employ the majority of the labor force, contribute the greatest to the total value-added by manufacturing, and consequently exert the greatest impact on the regional economy. What are the broad industrial distributions within the Southeast, how does the industrial mix vary from place to place, and what is the role of metropolitan areas in the South's manufacturing characteristics and composition? After answering these questions, the regional structure of Southern manufacturing is discussed in the context of interregional trade theory and the evolutionary concepts of macro location theory. The primary methodology employed is factor analysis.

Manufacturing firms analyzed in this study are those listed as having over one half million dollars in assets in January, 1973. *(11)* Although these constitute only about 3,500 plants in the 12 Southeastern states, these plants represent the dominant manufacturing base of the region and reveal the principal regional structure of manufacturing. It can be argued that emphasis on the rather large number of small firms has led in the past to a misleading picture of the basic regional structure of Southern manufacturing, as one has too often thought simply in terms of numbers of plants rather than the total impact of manufacturing on the economy. Large firms, measured by greater assets, play a disproportionately influential role in the regional economy. To be sure, the South has many small firms, frequently located in rural areas, with little capital investment, few workers, and low wages—characteristics of acknowledged importance in the region's manufacturing. This study, however, seeks to counterbalance these well-known and traditional features of Southern manufacturing by analysis of the larger firms which generally represent the more viable, modern, and influential elements of the economy.

ROLE OF MANUFACTURING IN METROPOLITAN AREAS. The larger the firm in total assets, the greater is the chance it will be located within a metropolitan area (SMSA) in the South. This generalization

probably applies to all parts of the United States, but its application to the Southeast implicitly raises the question of whether the rural locational preference of Southern industry, as measured simply by numbers of plants, has been somewhat overemphasized in the overall impact of manufacturing on the economy. Over half of all plants with more than one half million dollars in assets are located in SMSA's in the 12 Southeastern states, and over 57 percent with assets over a million dollars have metropolitan locations (Table 1). The percentages would be much

TABLE 1

PERCENTAGE OF MANUFACTURING PLANTS LOCATED IN SMSA'S, 1973

State	One half to one million dollars	Over one million dollars in assets	Over one half million dollars in assets
Alabama	54.2	67.6	62.2
Arkansas	40.9	43.5	42.4
Florida	68.3	77.8	74.3
Georgia	42.5	58.8	52.4
Kentucky	47.4	66.0	57.3
Louisiana	53.7	68.7	62.8
Mississippi	16.9	28.6	24.4
North Carolina	35.7	42.6	40.1
South Carolina	30.9	48.2	41.7
Tennessee	58.4	68.6	64.6
Virginia	38.1	51.1	45.5
West Virginia	43.9	45.1	44.4
Total	45.5	57.2	52.3

Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

higher, of course, if the data source permitted inclusion of urban areas not part of an SMSA. Still, rural industry is undeniably an element in the manufacturing structure of the South.

The metropolitan clustering of plants is evident in the Southeast, both for those over a million dollars in assets and for those between a

half and one million dollars (Figures 1 and 2). For all states, however, there is a higher percentage of plants in metropolitan areas for the over one million dollar asset category than in the lower asset category; comparison of Figures 1 and 2 also reveals the greater concentration in the higher category. Mississippi, the most "rural" state in manufacturing location, given the categories and data employed here, has only about a quarter of its plants of more than a half million dollars in assets located in SMSA's. Florida has the highest percentage of such plants in metropolitan areas (nearly three quarters), followed by Tennessee, Louisiana, and Alabama. Although there is considerable variation from state to state in the relative importance of manufacturing in metropolitan areas, the SMSA's in general play a dominant role in manufacturing location and hence exert a profound influence on the regional manufacturing structure of the Southeast.

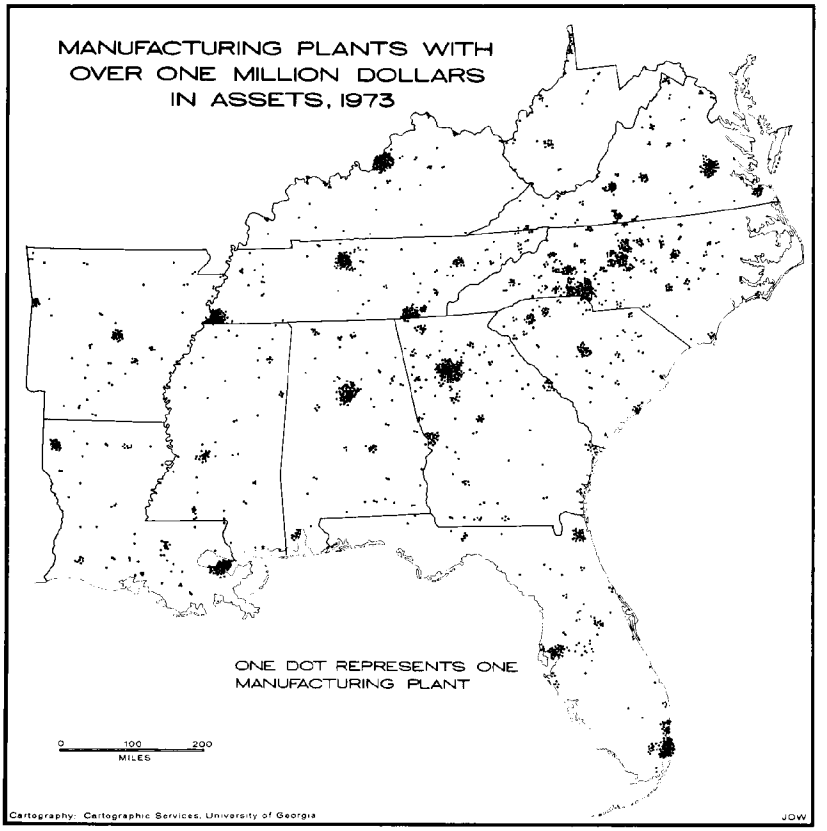

Figure 1

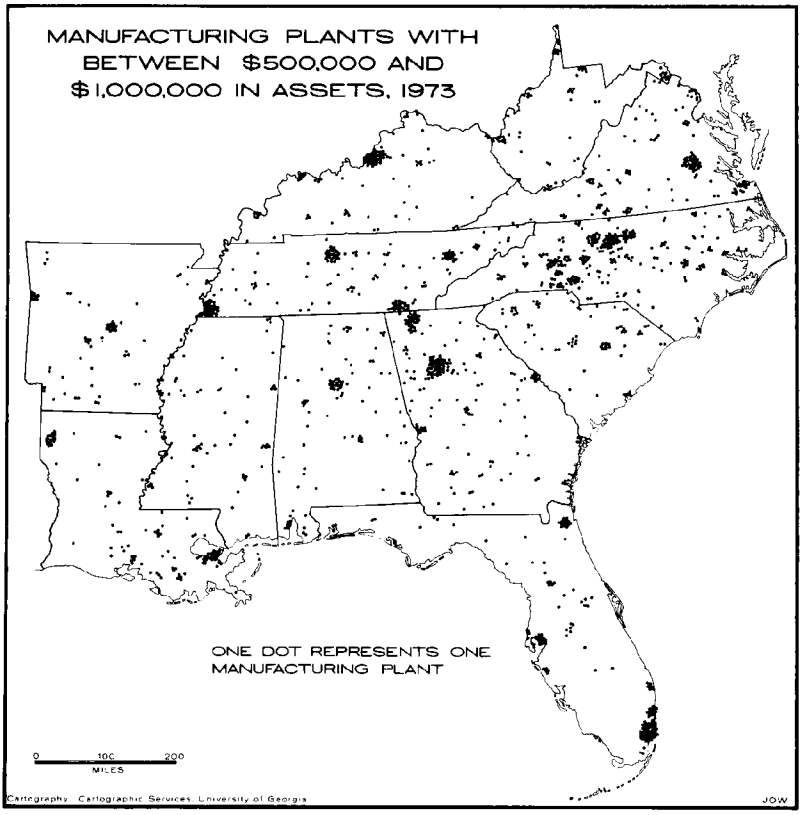

Figure 2

REGIONAL MANUFACTURING STRUCTURE. To measure the range of variation in industrial structure in the Southeast, two indices were computed as an initial step in analyzing a 12 state by 20 industry group matrix. *(12)* First, the index of absolute differences is computed by finding the "expected" number of product groups (two digit SIC) for each state for each of the 20 industrial categories, comparing the expected and actual value (absolute differences), summing these differences by state and by industry category, and dividing these sums by the respective state and industry totals. *(13)* The index measures the degree to which states are different in industrial composition and the degree to which industry groups are differently represented among the states. Large values correspond to large discrepancies.

West Virginia, a state not universally considered within the South, has by far the highest index, differing most from all other Southeastern

states in industrial composition (Table 2). Arkansas, Louisiana, and Florida, also peripheral in location, have above average index values. So too, however, do North and South Carolina, owing largely to the high concentration of textile production in these states. Tennessee differs least in industrial structure from the other Southeastern states. Virginia and Georgia are also rather similar to other Southeastern states in manufacturing structure.

TABLE 2

INDEX OF ABSOLUTE DIFFERENCES BY STATE

State	Index Value	State	Index Value
West Virginia	6.83	Mississippi	4.02
Arkansas	5.17	Alabama	3.78
North Carolina	4.78	Kentucky	3.01
Florida	4.41	Georgia	2.87
South Carolina	4.37	Virginia	2.79
Louisiana	4.19	Tennessee	2.19
		Mean	4.03

Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

The index of absolute differences establishes which of the industrial groups are most "typically" found among the states (Table 3). Thus, printing and publishing, closely followed by the category stone, clay, glass, and concrete, is distributed most equally (considering size of a state's industrial base) among the 12 states. Most disproportionately distributed are tobacco and textile mill products. The index values are skewed such that more industry groups fall below than above the mean. In general, the index of industry groups corresponds to one's overall expectations of industrial composition in the Southeast.

To compare each state with all other states in industrial structure, a second index, the index of dissimilarity, is used (Table 4). *(14)* This index is a refinement of the previous measure in that it permits more detailed statements of state to state differences. For example, although West Virginia differs most from all other states taken as a group, it is most like Alabama in relative industrial composition, with an index value of 28 (a value extremely close to the mean for the index of dissimilarity). The two states most similar are Georgia and South Carolina. Other similarities that could be emphasized are between Louisiana and Mississippi, Tennessee and Virginia, Tennessee and Kentucky, and Georgia and North Carolina.

TABLE 3

INDEX OF ABSOLUTE DIFFERENCES BY INDUSTRY GROUP

Industry Group (SIC NO.)	Index Value
Tobacco (21)	8.64
Textile Mill Products (22)	8.56
Leather and Leather Products (31)	7.86
Petroleum Refining (29)	7.46
Misc. Mfg. (39)	6.07
Electrical Machinery (36)	4.92
Professional and Scientific Equip. (38)	4.70
Primary Metals (33)	4.59
Transportation Equip. (37)	3.93
Furniture and Fixtures (25)	3.75
Apparel (23)	3.69
Pulp and Paper (26)	3.69
Rubber (30)	3.59
Fabricated Metal (34)	3.28
Machinery, except Electrical (35)	2.56
Food and Kindred Products (20)	2.47
Chemicals (28)	2.45
Lumber and Wood Products (24)	2.43
Stone, Clay, Glass, and Concrete (32)	2.32
Printing and Publishing (27)	2.29
Mean	4.46

Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

To test the relationship between the index of dissimilarity for states and the distance separating them, a correlation coefficient was computed for these two variables. Although the independent variable, distance, was measured in the crudest of fashions (by taking distance between the centroids of states), a surprisingly high coefficient of correlation was achieved, $r=0.905$, statistically accounting for over 81 percent of the variation in the index of dissimilarity. Of the eight residuals larger than 20, four involved West Virginia (with all index values underpredicted by proximity of states) and four included Virginia (underpredicted for North Carolina and West Virginia but overestimated for Arkansas and Louisiana). Despite the crudeness of the independent variable, to say nothing of the arbitrariness of using states as observations, it seems safe to conclude that the overall industrial structure of the Southeast varies geographically in a somewhat systematic manner.

TABLE 4

INDEX OF DISSIMILARITY BY STATE*

State	AL	AK	FL	GA	KY	LA	MS	NC	SC	TN	VA	WV
Alabama	—	29.2	26.3	27.1	18.3	23.4	22.6	34.6	32.3	21.6	25.4	28.0
Arkansas		—	29.3	34.9	21.8	23.5	20.2	38.0	38.6	24.3	23.0	35.8
Florida			—	30.9	18.2	23.5	25.7	40.6	37.8	25.4	23.6	35.8
Georgia				—	25.9	33.9	31.1	17.4	10.9	20.6	22.8	46.8
Kentucky					—	19.0	19.1	32.7	32.6	17.1	18.2	40.8
Louisiana						—	16.5	44.1	38.2	26.4	26.5	46.8
Mississippi							—	37.3	33.6	23.9	23.3	36.4
North Carolina								—	19.8	29.5	32.7	50.6
South Carolina									—	24.7	26.9	48.2
Tennessee										—	17.0	33.0
Virginia											—	40.8
West Virginia												—

*The mean of the index of dissimilarity by state is 28.45.
Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

As a next step, factor analysis was applied to determine what patterns exist among the industrial groups and the states. Each plant was placed into at least one SIC (two digit) category, 20 categories in all being used. Correlation coefficients, derived from relating each of the 12 states in terms of the 20 industrial categories representing all plants over one half million dollars in assets, were subjected to principal components analysis (Q-mode), with an eigenvalue threshold of unity. Factor analysis is used in the traditional sense of data reduction to determine associations and patterns among industry groups and states. Q-mode, as opposed to R-mode, is preferred since emphasis is on comparing states in industrial structure rather than comparing industry categories. *(15)* Results indicated two eigenvalues were greater than unity, the first factor accounting for 65 percent of the total variance and the second for over 18 percent. Thus, two groupings of states emerged from analysis at the state level.

The rotated factor matrix, plotted in Figure 3, isolated a group of

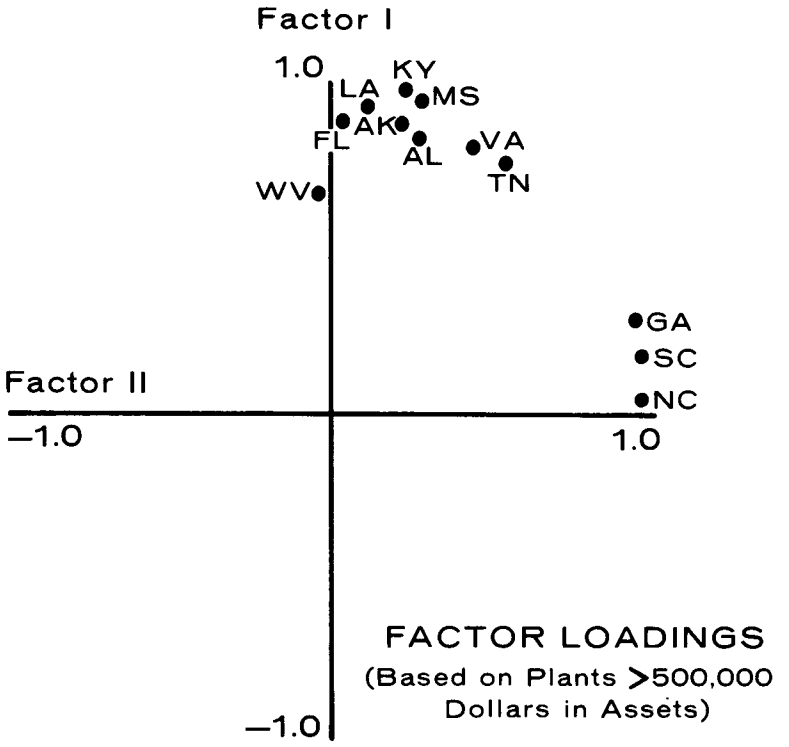

Figure 3

three states, representing the second factor, Georgia, North Carolina, and South Carolina, characterized by high factor scores on textile mill products (3.57) and apparel (0.99). Factor scores indicate which industrial categories chiefly contribute to each of the factors. The other Southeastern states constitute a single pattern (factor one) in which high factor scores are found for food and kindred products (2.94), lumber and wood products (1.29), fabricated metal products (1.19), and machinery, except electrical (1.09). These four industry types are not only rather evenly represented proportionately in these states but also occur with high frequency.

At this scale of analysis, two sets of industry types characterize the Southeastern states. One is clearly a textile mill and apparel component of Southern manufacturing, focused on the Piedmont, and representing a well-known feature of the industrial structure. The other component depicts the general Southern manufacturing type, embracing the remaining Southeastern states and involving both traditional and more recently introduced elements of manufacturing in the Southeast. The traditional manufacturing groups include the food and lumber products for which the locational influence of local raw materials is important. The manufacture of nonelectrical machinery and metal fabrication represents industries more recently introduced into the Southeast and superimposed on the traditional manufacturing base. Thus, the 12 by 20 data matrix reduces to a 12 by two factor loading matrix, the latter describing over 80 percent of the data variability in the former matrix.

Separate factor analysis runs were made for plants above one million dollars in assets and between one half and one million dollars. Overall, similar results occurred. In the case of the smaller plants, however, the first, or general, factor took on even greater significance, only Georgia and North Carolina having highest factor loadings on the second rotated factor, again the textile factor. Loadings greater than 0.5 occurred on the second factor for South Carolina, Virginia, and Tennessee, though higher loadings were on the first factor for these states. Thus, the rather clear-cut patterns observed for plants over one half million dollars in assets become somewhat less distinct for the smaller asset group of plants.

For the over one million dollar category, however, greater detail is observed from the application of factor analysis. Three factors were rotated following the eigenvalue criterion, and these factors accounted for approximately 90 percent of total variance (Table 5). The textile and apparel factor (accounting for 20 percent of total variance) was consistent with the results of analysis of the over one half million dollar asset plants, with highest loadings for Georgia, North Carolina, and South Carolina. The third factor (10 percent of total variance) isolated Alabama and West Virginia, with highest factor scores for fabricated metal products (3.31) and machinery, except electrical (1.41). The first

TABLE 5

ROTATED FACTOR LOADINGS FOR MANUFACTURING PLANTS OVER ONE MILLION DOLLARS IN ASSETS*

State	Factor I	Factor II	Factor III	Communalities
Alabama	0.57		0.72	0.89
Arkansas	0.93			0.97
Florida	0.89			0.85
Georgia	0.41	0.89		0.93
Kentucky	0.82		0.49	0.88
Louisiana	0.89			0.93
Mississippi	0.90			0.86
North Carolina		0.94		0.90
South Carolina		0.97		0.87
Tennessee	0.69	0.53		0.87
Virginia	0.86			0.87
West Virginia			0.94	0.90

*only loadings >0.4 shown.
Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

or general factor (on which food and kindred products had a factor score of 3.73) comprised the other states and accounted for nearly 60 percent of the state to state variability in manufacturing structure in the Southeast.

URBAN VERSUS RURAL MANUFACTURING STRUCTURE. Manufacturing plants were classified as metropolitan (located within an SMSA) or nonmetropolitan (outside an SMSA). Separate factor analysis was performed on each data set to determine what differences existed between metropolitan and nonmetropolitan manufacturing structure. As before, Q-mode principal components analysis was performed with normal varimax rotation. In both cases, three rotated factors were extracted, each accounting for just over 85 percent of the total data variability.

Rotated factors for states, based on manufacturing plants over one half million dollars in assets in SMSA's, were very similar to the factors derived for all plants above a million dollars in assets (Table 6). The first factor described the food and kindred products group (factor score of 3.83), with a number of states having high loadings on this factor. Again, factor two was the textile component (factor score of 3.57), and factor three the fabricated metal (score of 2.64) and machinery, except electrical (score of 2.45), patterns. West Virginia, Alabama, and Kentucky had their highest loadings on this third factor, and Florida, Virginia, and Louisiana also had loadings greater than 0.4. Thus, metro-

TABLE 6

ROTATED FACTOR LOADINGS BY STATE FOR MANUFACTURING PLANTS OVER ONE HALF MILLION DOLLARS IN ASSETS LOCATED IN SMSA'S*

State	Factor I	Factor II	Factor III	Communalities
Alabama	0.51		0.76	0.83
Arkansas	0.87			0.77
Florida	0.71		0.56	0.82
Georgia	0.62	0.72		0.95
Kentucky	0.56		0.74	0.90
Louisiana	0.86		0.40	0.91
Mississippi	0.91			0.85
North Carolina		0.94		0.88
South Carolina		0.96		0.93
Tennessee	0.78	0.49		0.93
Virginia	0.73		0.44	0.79
West Virginia			0.95	0.91

*only loadings >0.4 shown.
Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

politan manufacturing structure is quite similar to the structure of the over one million dollar plants because the latter tend to be located in metropolitan areas.

The nonmetropolitan structure of manufacturing is somewhat different (Table 7). Although a high standard score for factor one is associated with food and kindred products (3.19), two other industry types have high scores for this factor: lumber and wood products (1.47) and stone, clay, glass, and concrete (1.05). Factor one, therefore, seems to represent a "rural" version of the metropolitan factor one, since this rural factor is more oriented to the processing of dispersed raw materials. The second is the textile factor (score of 3.41), recognized as having both a metropolitan and nonmetropolitan location. Again, lumber, because of its ubiquitous distribution within most of the South, has a high standard score on the second factor (1.53), as does apparel manufacturing (0.92). The third factor has its highest score for machinery (4.15) and highest loadings for Louisiana, Kentucky, and Tennessee.

To delineate further the structure of metropolitan manufacturing in the Southeast, the 13 SMSA's with the largest number of plants over a half million dollars in assets were analyzed. The 13 by 20 data matrix was analyzed by the Q-mode factor analysis with the same procedures as previously described.

TABLE 7

ROTATED FACTOR LOADINGS BY STATE FOR MANUFACTURING PLANTS OVER ONE HALF MILLION DOLLARS IN ASSETS NOT LOCATED IN SMSA'S*

State	Factor I	Factor II	Factor III	Communalities
Alabama	0.40	0.75		0.77
Arkansas	0.78			0.85
Florida	0.87			0.78
Georgia		0.96		0.93
Kentucky			0.96	0.96
Louisiana			0.97	0.96
Mississippi	0.82		0.40	0.90
North Carolina		0.93		0.88
South Carolina		0.90		0.91
Tennessee			0.85	0.96
Virginia	0.64	0.55	0.45	0.90
West Virginia	0.53			0.44

*only loadings >0.4 shown.
Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

The 13 SMSA's were correlated with one another in terms of the 20 industrial categories. Factor analysis provided three rotated factors, accounting for over 75 percent of the total variance (Table 8). High scores on factor one revealed food processing (2.11) and metal fabricating (2.41) to characterize the first factor, with most of the major Southeastern metropolitan areas loading highly on this factor. The second factor was clearly a textile factor (standard score of 3.92), and the Charlotte, Chattanooga, and Greensboro-Winston-Salem-High Point SMSA's have their highest loading on factor two. The last factor had high standard scores for pulp paper (2.31), food processing (1.83), printing and publishing (1.34), and chemicals (1.15). Richmond and Jacksonville had the highest loadings on the third factor. Atlanta, the largest and most diversified manufacturing city in the Southeast, entered all three industrial patterns. In sum, large Southeastern metropolitan areas may be described in terms of three major elements of industrial structure: 1) a metal fabricating-food processing factor common to eight of the 13 SMSA's, 2) a textile factor (Piedmont SMSA's and Chattanooga), and 3) a pulp and paper, printing, and chemical factor. It may be that the largest Southern cities are leaders in developing not only a more diversified industrial base but also one more typical of the rest of the United States.

CONCLUDING REMARKS: LOCATION THEORY AND REGIONAL STRUCTURE. The implications of this research describing the regional

TABLE 8

ROTATED FACTOR LOADINGS FOR MANUFACTURING PLANTS OVER ONE HALF MILLION DOLLARS IN ASSETS IN MAJOR SMSA'S*

SMSA's	Factor I	Factor II	Factor III	Communalities
Atlanta	0.45	0.56	0.61	0.88
Birmingham	0.83			0.71
Charlotte		0.94		0.89
Chattanooga		0.85		0.82
Greensboro**		0.94		0.89
Jacksonville			0.75	0.67
Louisville	0.74		0.48	0.82
Memphis	0.57		0.47	0.55
Miami	0.90			0.85
Nashville	0.55			0.48
New Orleans	0.75			0.71
Richmond			0.96	0.94
Tampa	0.79			0.71

*only loadings >0.4 shown.
**Greensboro-Winston-Salem-High Point.
Source: computed by author from Dun and Bradstreet Directories (see footnote 11).

structure of manufacturing in the Southeast should be noted in the context of locational theory. A number of studies have suggested that the South began its rapid industrial growth as a result of firms locating in the South primarily to take advantage of inexpensive, surplus labor and secondarily natural resources in order to serve a national market. *(16)* Such studies embrace the theory of interregional trade and comparative advantage in the initial stimulation of manufacturing growth. Capital was attracted from outside the region because of the favorable profit opportunities in the South. Income resulting from export sales to other regions was at least partly invested into population-serving activities and a gradual rise in per capita incomes occurred. As incomes rose, local markets took on greater significance, spurring further growth and expansion. According to interregional trade theory, it is the production for export which is a direct determinant of a region's industrial growth.

The textile industry, which consistently appeared as a major component of Southern manufacturing in this analysis, is a good example of an industry fitting the interregional trade theory, as is tobacco manufacturing. Given the disparity between urban and rural wage rates in

the South, the desire to serve national markets through the advantage of favorable wage rates in rural areas no doubt continues to be a factor in the rural locational preference of manufacturers. *(17)*

In contrast to the interregional trade theory is the intraregional, macro location theory. This theory would hold that the South industrialized, to use Greenhut's words, because of "natural growth factors." *(18)* Manufacturing has located in the South to serve primarily local and regional markets. The first step involves a lowering of transportation costs, permitting some interregional trade and a gradual shift away from a subsistence economy based largely on local resource advantages: commercial agriculture develops along with a rise in per capita income. At some critical threshold, further increases in income will not be used to purchase additional agricultural products, and a demand for manufactured goods will exist. Because of capital accumulation from the agricultural sector and the opportunity for local industry to serve local demand, investment in manufacturing occurs. *(19)* Initially, manufacturing will be limited to low investment industry and principally to process the region's food and other raw materials. As income continues to rise, the structure of industry will begin to diversify and tertiary activity becomes more important. Eventually, the region will develop a sufficiently large industrial base to justify importing materials, as well as capital and technology. The final step occurs when the region has matured to the level where it exports substantial amounts of finished goods, capital, and technology to other areas.

The South, although it exports finished goods, has not reached this last step. However, materials are increasingly being imported into the South as the region interacts nationally by participating in the strategy of comparative regional advantages. The growing importance of metal fabricating in the South points in this direction. Nevertheless, the region continues to rely to an important degree upon processing local materials, as with food processing and lumber, for example. Consequently, the industrial base is not fully diversified.

The application of growth pole theory within the South would seem to be only indirect and superficial in many ways at the present time. Indeed, there is evidence that manufacturing growth continues to take place in rural peripheral locations as well as in metropolitan growth centers. Such rural growth may be tied to traditional Southern values, as Nicholls suggested. *(20)* In any case, such rural industrialization may not be optimal in the long run in bringing about the kind of economic and social change desired by industrial developers. *(21)*

The description of the current structure of manufacturing in the 12 Southeastern states, at least as far as the data in this study are concerned, suggests the operation of elements of both the interregional and the intraregional theory of economic growth. The South has grown

through production for national markets; at the same time industry has developed because of conditions internal to the region. The fact remains that the manufacturing structure in the South reflects a developmental lag compared to the rest of the nation. It is probable that much of the future growth will be metropolitan oriented, leading initially to further contrasts between rural and urban manufacturing structure, with the latter gradually coming to dominance in the South as it is elsewhere in the U. S.

* * *

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(11) *Dun and Bradstreet Million Dollar Directory, 1973* and *Dun and Bradstreet Middle Market Directory, 1973*, Dun and Bradstreet, New York, 1973.

(12) Some plants manufacture products falling into more than one SIC group; consequently this research analyzes, in the strictest sense, the spatial structure of industrial production, rather than the structure of the plants. The former seems a more suitable measure of regional manufacturing structure.

(13) Given an N by M matrix, where N represents the states and M the industry groups, the "expected" value for any cell may be computed, as in Chi Square analysis, by

$$E_{ij} = \frac{\Sigma N_i \; \Sigma M_j}{T}$$

where E_{ij} = the expected number of product groups in cell ij
N_i = actual cell values by row (state) i
M_j = actual cell values by column (industry group) j
T = total value (sum) of all cells in matrix

The index of absolute differences for states is

$$I_i = \frac{|A_{ij} - E_{ij}|}{\Sigma N_i}$$

and for industry groups

$$I_j = \frac{|A_{ij} - E_{ij}|}{\Sigma M_j}$$

where A_{ij} = actual number of product groups in cell ij.

(14) The index of dissimilarity, a commonly employed measure of relative differences, is computed as

$$ID = \sum_{i=1}^{n} \frac{|(X_i/\Sigma X_i) - (Y_i/\Sigma Y_i)|}{2} \cdot 100$$

where X_i represents one state compared with a second state Y_i for industries i.

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MANUFACTURING DIFFUSION AS A GROWTH POINT PROCESS IN THE SOUTHEAST

*William A. Rabiega and Roland G. Wood**

INTRODUCTION. Extensive manufacturing development in the southeastern United States is generally accepted to have taken place in this century. Indeed, study of the relocation of the textile industry and its subsequent expansion in the Appalachian Piedmont has almost become hackneyed through its wide use to illustrate (1) the effects of manufacturing introduced into a relatively underdeveloped and agrarian region and (2) the role of labor costs in attracting specific types of manufacturing. An introduction of industry into selected centers, as in the 1920-1940 relocation of textile plants from New England to the Southeast, but by government rather than private entrepreneurs, would be an initial step in regional economic development following the classic growth point model.

The model outlines a sequence of events which ultimately leads to dispersion of manufacturing and wealth. According to the theory a "motor industry," i.e., an industry which attracts extraregional income, locates at a growth point. Workers respond to the high wages offered by this industry by commuting to it from the surrounding area. Their wages are then spent at their places of residence, creating a multiplier and allowing some accumulation of capital. This capital is eventually used to establish new industry away from the original growth point, which has by now diversified its workforce into a number of tertiary activities, thereby receiving the designation of growth pole. The outlying center with new manufacturing becomes a growth point, and the process continues until manufacturing employment has been evenly spread over the region. There is considerable controversy over whether this process takes place in fact, and hence, if an economic development policy following growth point principles is wise. *(1)*

Thus, it is germane to review industrialization in the Southeast with regard to how well it follows classical growth point theory. It might be hypothesized that manufacturing activity did begin as highly dispersed, owing to the region's generally low proportion of employment and low technological level, then became more concentrated with the introductions of industry (primarily textiles in the case of the Southeast), and still later became less concentrated as economic activity spread from growth poles. This sequence would support the growth point hypothesis. Alternatively, if the process ended with concentration of manufacturing in the original centers of industrial introduction, approximating a "back-

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wash" or "polarization" effect, the case against a regional economic development policy following growth point principles would be strengthened. *(2)*

THE PROBLEM. The basic problem of this investigation was to establish whether industrial development in the Southeast since 1920 has followed growth point processes, or whether it has continued to concentrate in original centers of introduction. The analysis employed county level data in Alabama, Georgia, North Carolina, and South Carolina for the census years 1920 through 1970, inclusive. The general concentration pattern was analyzed for each ten year period.

CLASSICAL GROWTH POINT THEORY AS A DIFFUSION PROCESS. Analysis of concentration patterns is appropriate to the problem because the classic growth point model has been increasingly noted to represent a diffusion process. *(3)* In particular, the diffusion is of the hierarchical, expansion type. The growth point process is implicitly hierarchical in that the spread of economic activity can be viewed as a "trickling down" effect through a hierarchy in which the apex is the initial introduction point for manufacturing. It is an expansion diffusion situation in that the relative dominance of initial centers should decrease as dispersion of industry takes place, but there should never be total relocation of manufacturing from introduction points.

Whether the scale is micro, meso, or macro is immaterial to the type of analysis summarized here. Issues concerning scale pertain to explicit patterns of diffusion of specific innovations. This analysis encompassing four states was at a macro scale. However, because all manufacturing was included rather than a single category or a new process within a single economic activity, only the most general attributes of the model could be tested, i.e., the change in general concentration patterns over the stated time periods. Also, because multiple introduction points were assumed and the characteristic adopter waves were overlapping and refer to many different processes, an explicit analysis of waves of diffusion appropriate to the stage of the process could not be approached directly. *(4)*

METHODOLOGY. The basic measure employed to implement this analysis was the modified location quotient and the M-statistic. The modified location quotient is derived from the standard location quotient (LQ) *(5)*, but it is bounded on both the dearth and abundance ends of the distribution. Thus, while the LQ is bounded only in dearth by 0.00 and in concentration only by the size of explicit samples, the m-score (modified location quotient) is bounded by -1.00 for dearth and $+1.00$ for abundance and has a theoretical complete dispersion at 0.00. Also, the values on the m-scale can be considered interval level data. *(6)*

The first step in this analysis was the calculation of m-scores for the 372 counties under investigation for the census years 1920 to 1970

with manufacturing employment as the variable under question and total workforce as the referent variable. The results of these calculations were mapped using SYMVU. *(7)*

Second, the M-statistic, the simple mean of the m-scores, was calculated for each of the years under investigation. *(8)* This summary statistic gave a general index of the degree of concentration of manufacturing employment in the study area for each time segment. The M, like its components, the m-scores, is bounded by ± 1.00 and has a central tendency of 0.00 (complete dispersion). As it is a statistic, M can be considered to have a normal sampling distribution. Because these are the characteristics of the Rho distribution, it is possible to use the z-test with the Fisher transformation to test the statistical significance of the differences in concentration from census period to census period. *(9)* Thus, seven one-tailed z-tests were executed, one for each intercensal period and one comparing the early peak concentration year to the 1970 concentration pattern.

If a classic growth point diffusion did take place, the M should start relatively close to 0.00, or complete dispersion, move to a minus value, indicative of many counties with complete dearth of manufacturing employment and a few with relatively great abundance, and move closer to 0.00 in subsequent time periods as the process continues and manufacturing disperses from the introduction points. In terms of one-tailed z-tests, the rejection region is in the negative tail of the sampling distribution until the peak concentration year is reached, i.e., that year which exhibits an M with the greatest negative deviation from 0.00. Thereafter, the distribution should be moving to greater dispersion, thus moving positively from the prior time segment toward 0.00. Rejections subsequent to the year of peak concentration will be in the positive tail of the sampling distribution.

While the period-to-period z-test on the M's will verify whether or not the general aspects of the model are being met—the manufacturing is at first concentrated and then becomes more dispersed—they will not confirm whether the model is being met in the hierarchical developmental progression central to it. Evidence of this progression would exist if areas of middle intensity first move to higher intensity and places of originally low concentration are slower to develop. Simultaneously, divergence in concentration among entities in the distribution should be diminishing.

A usual way to analyze such changes in variability would employ the standard deviation and mean deviation of the distributions for specific years. These have no utility in this instance, however, because the scores are bounded by ± 1.00. If the distribution is symmetrical and centered at total dispersion, 0.00, the standard deviation is primarily a function of sample size. *(10)* If the distribution does not have an M of 0.00, it is necessarily asymmetrical and the standard deviation is an

improper measure of dispersion. As the mean deviation uses the standard deviation as one of its elements, it is also inappropriate to analysis of this score array. *(11)*

An analysis of the arrays according to their skewness and kurtosis has been attempted. Even this must be done with some reservations because the actual score arrays may be multimodal, while indices of skewness and kurtosis are most effective with unimodal distributions. However, it was possible using these measures to compare which portions of the m-score scales loaded most heavily for the sequenced periods. If there is a positive skew in the year beginning the diffusion, i.e., only a few places exhibit high m-scores and many show low ones, the pattern should be that which would result from introducing new industry in the first stages of economic development. If skewness diminishes from that point in time, and even reverses, showing a progression of higher loadings of scores in the middle and then abundance areas of the distribution, it is indicative of a growth pole process. Also, if the distribution becomes increasingly leptokurtic, it is indicative of scores grouping in the center of the distribution, thus following the model.

In addition, the movement of manufacturing concentration from selected high intensity areas about 1940 to 1970 was examined. If the intensity does increase in adjacent counties initially and later in the peripheral ones, then there is evidence to support the growth point model. Alternatively, evidence for a backwash would exist only if the intensity increased at the high concentration county while remaining the same or decreasing in adjacent counties.

SOME COMMENTS ON THE DATA. Because the data for this investigation were taken from the employment-by-industry section of the U. S. Censuses of Population, there were some problems in standardizing across periods. It was possible to obtain data for all 372 counties from 1940 to 1970. Unfortunately, the 1930 census aggregated some counties and failed to report others so that there were only 350 units in that year. Also, the 1920 census gave no data on workforce; therefore, these were estimated to be the same proportion of the population by county in 1920 as in 1930. Thus, while the 1940 to 1970 data have only those errors inherent to the census, the figures for earlier years are of lesser quality.

CHANGES IN CONCENTRATION 1920-1970. The m-score surfaces from 1920 to 1970 are shown in Figures 1 through 6. Even in these graphic representations, one can see a diffusion of concentration. The M's for each of the years, z-test for the changes by decade, and an additional test for change from 1940, the year of greatest concentration, to 1970 are reported in Table 1. While it is clear that manufacturing was concentrated in certain counties of these states in 1920, indicating that development had already moved past an agrarian/dispersed manufac-

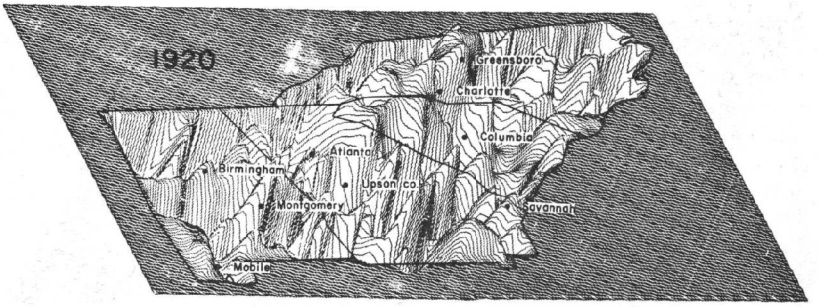

Figure 1. Concentration surface of manufacturing employment for counties of Alabama, Georgia, North Carolina, and South Carolina, 1920. (The plane surface is at $m_1=0.0$.)

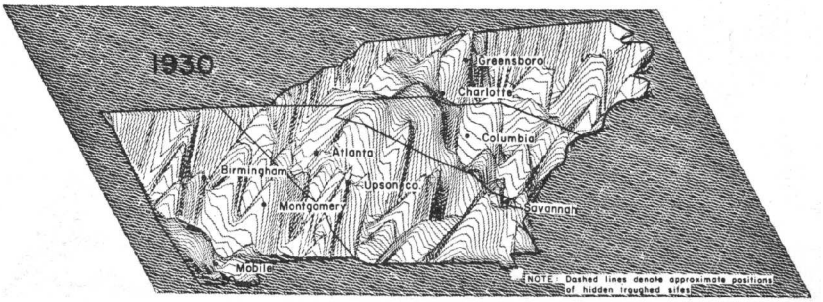

Figure 2. Concentration surface of manufacturing employment for counties of Alabama, Georgia, North Carolina, and South Carolina, 1930. (The plane surface is at $m_1=0.0$.)

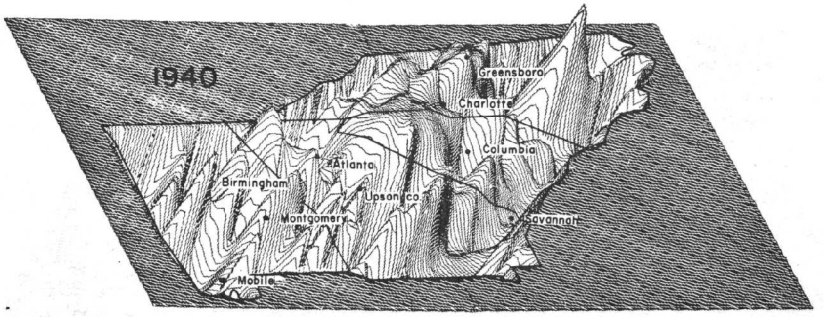

Figure 3. Concentration surface of manufacturing employment for counties of Alabama, Georgia, North Carolina, and South Carolina, 1940. (The plane surface is at $m_1=0.0$.)

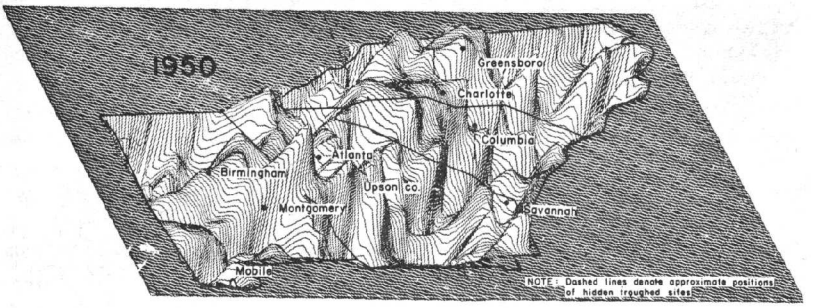

Figure 4. Concentration surface of manufacturing employment for counties of Alabama, Georgia, North Carolina, and South Carolina, 1950. (The plane surface is at $m_i=0.0$.)

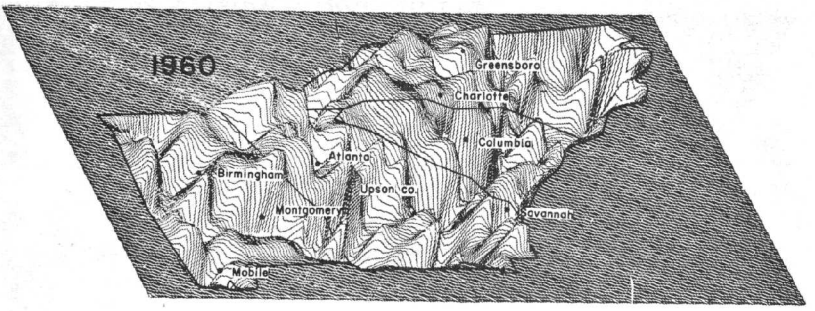

Figure 5. Concentration surface of manufacturing employment for counties of Alabama, Georgia, North Carolina, and South Carolina, 1960. (The plane surface is at $m_i=0.0$.)

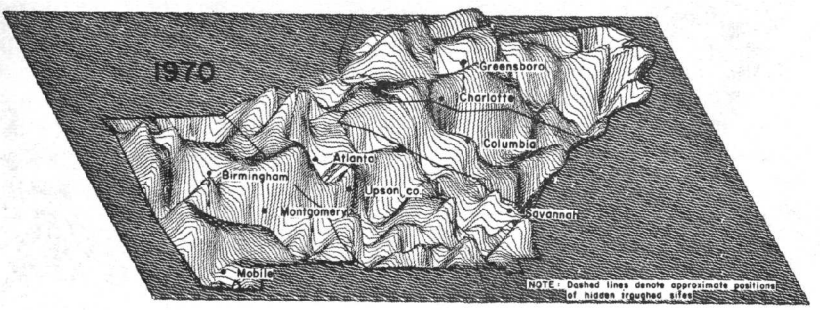

Figure 6. Concentration surface of manufacturing employment for counties of Alabama, Georgia, North Carolina, and South Carolina, 1970. (The plane surface is at $m_i=0.0$.)

turing state, it is also clear that 1940, in having the greatest absolute M, marked the beginning of a diffusion which is still continuing.

The M statistics and z-tests show that concentration of manufacturing increased in the Southeast between 1930 and 1940. The reasons for this are not the immediate subject of this paper. That this change represented an infusion of industry rather than a retrenchment of existing industry is fairly certain because manufacturing employment rose from 580,905 in 1930 to 736,411 in 1940. Further, there is less than a one percent chance that such a change in concentration pattern could occur randomly. It may be concluded that 1940 is the census year from which growth point diffusion might be traced.

TABLE 1

GENERAL CONCENTRATIONS OF MANUFACTURING IN COUNTIES OF ALABAMA, GEORGIA, NORTH CAROLINA, AND SOUTH CAROLINA, 1920-1970

Year	M	z-score for the difference from the previous year
1920	−.40504	5.769*,***
1930	−.36751	.62473
1940	−.49293	−2.04545***
1950	−.22184	4.23798***
1960	−.13355	1.19533
1970	−.02896	1.50774**
1940-1970	——	6.94105***

*compared to a totally dispersed pattern (M=0.0)
**significant at .10 level
***significant at .01 level
Source: calculated by the authors.

The subsequent string of M's from 1940 to 1970's value of −.02896 shows continuing dispersion. Whether this dispersion came from new manufacturing is not at question because the diffusion process is of the expansion type. Changing concentration from either course would be consistent with the model. The extreme z of 6.94105 shows that industry was much more dispersed in 1970 than in 1940. Thus, it may be concluded that the type of diffusion process anticipated by the growth point model did occur in these four states.

SKEWNESS AND KURTOSIS OF THE ARRAYS. The indices on skewness and kurtosis reinforce this conclusion (see Table 2). The year beginning the diffusion exhibits a considerable right skew and is to a small degree platykurtic. This conforms to the pattern hypothesized to exist

early in a diffusion. In 1950, near normality is shown on both indices. Thus, the middle regions of the array are loaded more heavily and the expected change is approximated. By 1960, the array exhibited a slight left rather than right skew. The process has continued to such a point

TABLE 2

SKEWNESS AND KURTOSIS OF MANUFACTURING CONCENTRATION ARRAYS*

Year	Skewness (g_1)	Kurtosis (g_2)
1920	.20501	−1.31879
1930	.16502	−1.22578
1940	.64668	− .98330
1950	.27727	.14214
1960	−.31275	− .83402
1970	−.52243	.04860

*For an explanation of the g_1 and g_2 measures see: G. A. Ferguson, *Statistical Analysis in Psychology and Education*, McGraw-Hill, New York, 1966, pp. 75-76.
Source: calculated by the authors.

that manufacturing-scarce counties occupy the low-load tail. The increasing diminution of scarce counties continued in 1970 as the left skew became slightly more marked. This year also exhibited virtually normal kurtosis, having become somewhat more leptokurtic since 1960. The important change in arrays from 1940 to 1970 is that the beginning right skew moved to a left skew by continuous steps. This indicated that manufacturing distribution became more intense over the period; a constant increase of scores in the middle ranges of the distribution is evident in this change. The distribution was slightly leptokurtic in 1970, whereas for 1940 it was considerably platykurtic. Both sets of scores indicate the growth pole diffusion pattern was followed.

DIFFUSIONS IN SELECTED SUBSAMPLES. The results of analysis of the form of the general array shows not only that the pattern moved from one of concentration to dispersion, but also that this movement occurred by loading greater numbers of scores in the middle regions of the concentration scale. Thus, in general, it affirmed the expansion diffusion of the growth point model. It remained to be seen if in some instances, that diffusion took place over continuous space. To this end, the concentration patterns over the period of diffusion have been analyzed for two regional subsamples.

In both instances, the base county was selected because of the relatively high concentration of manufacturing employment it exhibited in 1940. A ring of counties adjacent to the base county and a third group

of counties adjacent to this ring were then identified. If a spatially continuous diffusion of manufacturing employment took place, the first ring would show increasing concentration through the middle time periods, 1950 and 1960, and stabilization between 1960 and 1970. The second ring, being more remote from the assumed origin of the diffusion, should be continuing to draw employment, thus increasing its concentration, through 1970. Ideally, the base county will be moving from abundance toward average concentration through the time period.

Both the Jefferson County, Alabama (Birmingham), and Upson County, Georgia, samples show a dispersing of manufacturing employment from 1940 to 1970 (see appropriate sections of Figures 3 through 6 and Tables 3 and 4). The general variability of scores has decreased in

TABLE 3

CONCENTRATION SCORES IN JEFFERSON COUNTY, ALABAMA, AND SURROUNDING COUNTIES, 1940-1970

County	1940	1950	1960	1970
Jefferson	.35493	−.00009	−.07364	−.82746
First Ring Counties				
Bibb	−.96877	−.17057	.12412	.15741
Blount	−.91495	−.62198	−.21147	.06627
St. Clair	−.36073	.03923	.07115	.06609
Shelby	−.56411	−.01722	.04026	−.00945
Tuscaloosa	−.44228	−.11894	−.21539	−.27361
Walker	−.72144	−.49604	−.30204	−.15381
Second Ring Counties				
Calhoun	.13742	.14279	.02835	.01006
Chilton	−.80132	−.27136	−.19965	−.07443
Coose	−.54462	.08005	.13044	.22286
Cullman	−.90056	−.60870	−.31648	.01869
Fayette	−.77913	−.26253	.03919	.19753
Greene	−.97801	−.71611	−.57411	−.37716
Hale	−.96754	−.60275	−.29214	−.06520
Marshall	−.56680	−.52539	.01486	.01930
Perry	−.82279	−.52415	−.47328	−.23090
Pickens	−.74407	−.35959	.08496	.15626
Talladega	.11014	.15937	.10457	.14069
Winston	−.81052	−.23071	−.10666	.23946

Source: calculated by the authors.

both cases. The first ring of counties around Jefferson County, discounting Tuscaloosa and Walker Counties which have a high number of education employees, moved quickly toward concentration from 1940 to 1960 and remained approximately stable with m-scores near zero between 1960 and 1970. The second ring of counties generally increase in concentration throughout the period. In the few instances where

TABLE 4

CONCENTRATION SCORES IN UPSON COUNTY, GEORGIA, AND SURROUNDING COUNTIES, 1940-1970

County	1940	1950	1960	1970
Upson	.31819	.31592	.27533	.03083
First Ring Counties				
Crawford	−.25138	−.15538	−.21698	.02964
Lamar	.05749	.11053	.12334	.21091
Meriwether	−.34475	.00244	.00243	.08163
Monroe	−.50885	.05854	.04338	.06202
Pike	−.62307	−.10358	.06634	−.36406
Talbot	−.67131	.09626	.12331	−.09402
Taylor	−.81099	−.38660	−.32866	−.35500
Second Ring Counties				
Butts	−.19423	.05434	.05916	.08034
Coweta	.13296	.12790	.14304	.13158
Fayette	−.78349	−.18039	−.10701	−.34340
Harris	−.49863	.07538	.02156	.02246
Jasper	−.89070	−.24214	−.06127	.07960
Jones	−.51782	.06504	−.00457	−.05564
Macon	−.80979	−.47412	−.29929	−.04271
Marion	−.95685	−.28474	−.29085	−.09905
Peach	−.59301	−.39329	−.49494	−.63607
Schley	−.75578	−.40356	.01013	.03507
Spalding	.27138	.25977	.21224	−.35358
Troup	.23139	.28121	.24127	−.00794

Source: calculated by the authors.

counties started with moderate abundance, e.g., Calhoun and Talladega, they have stabilized at that level through the period. Finally, Jefferson County itself became deficient in manufacturing employment. This is probably a result of a huge increase in nonmanufacturing employment

rather than a relocation of factories originally in this county to neighboring ones. All of these conditions again support the growth point model.

The Upson County sample, beyond the diminution of general variability, gives less conclusive evidence for or against the model. Upson itself moved toward 0.00 as expected, but the first-ring counties seem to change somewhat erratically. The second-ring group tends toward increasing concentration, but some continue to remain deficient in manufacturing. This does not necessarily show a situation of poor economic health but may reflect a strong alternative local economic base.

SUMMARY AND CONCLUSIONS. It is clear that a diffusion of industrial employment which follows the expected output of a growth point process did take place from 1940 to 1970 in the four states studied. This diffusion is indicated by the general concentration pattern, by the form of the concentration score distributions, and to a lesser degree, by the examples of the spread of local employment which were investigated. It may be concluded that a growth point development process for manufacturing has occurred in the Southeast.

This conclusion, however, must be qualified in several ways. First, this study has examined only one of the first-round effects of the process, the location of manufacturing employment. There is no evidence in this study concerning the capital relocation and accumulation tenets or the interactivity relationships which are also integral to the theory. While it is evident that the behavior anticipated by the theory did occur, it has not been demonstrated that it occurred because of the sequence of events depicted in the theory. In particular, much of the spread of manufacturing employment, especially in the Jefferson County example, may not indicate actual new plant locations, but rather long distance commuting to a single narrowly bounded manufacturing district. While this relocated basic payrolls, a first round effect of the growth point process, it may be that the later effect of new manufacturing locating away from original growth centers has not occurred. Even if new manufacturing located in this manner, capital formation in areas surrounding the introduction center, as posited in the model, may have nothing to do with the eventual concentration pattern.

Further research on a micro level, detailing each of the effects of the growth point theory, must be carried out before all the particulars of the paradigm can be confirmed. However, it remains that on a macro scale, manufacturing in the states of Alabama, Georgia, North Carolina, and South Carolina diffused according to the precepts of the growth point model from 1940 to 1970. The policy of fostering broad regional economic development by the establishment of growth centers is supported by this evidence.

* * *

(1) Regional development policy following growth pole tenets is discussed in a number of places. Two are: B. J. L. Berry, "Hierarchical Diffusion: The Basis of Developmental Filtering and Spread in a System of Growth Centers," in P. W.

English and R. C. Mayfield, (eds.), *Man, Space, and Environment*, Oxford University Press, New York, 1972, pp. 340-358; and J. Friedmann, and W. Alonso, (eds.), *Regional Development and Planning*, The MIT Press, Cambridge, 1964, pp. 1-13.

(2) The "backwash" or "polarization" effect is used as an argument against growth point development policies. Among the places this effect is elaborated are: A. O. Hirschman, "Interregional and International Transmission of Economic Growth," *The Strategy of Economic Development*, Yale University Press, New Haven, Conn., 1958, pp. 183-201: N. M. Hansen, "Development Pole Theory in a Regional Context," *Kyklos*, Vol. 20, 1967, pp. 709-725. The argument against growth pole strategies because of backward probabilities is particularly advanced in: V. Nichols, "Growth Poles: An Evaluation of the Propulsive Effects," *Environment and Planning*, Vol. 1, 1969, pp. 193-208.

(3) See Berry, *op. cit.*; also L. A. Brown, "Diffusion Processes: Recent Developments and their Relevance to Growth Pole Effects," a paper prepared for the International Geographical Union Pre-Congress Meeting, unpublished.

(4) See T. Hagerstrand, *The Propagation of Innovation Waves*, Lund Studies in Geography B-4, Gleerup, 1952.

(5) The m-score is calculated subsequent to calculating a standard location quotient. The formulas are as follows:

$$m_i = LQ_i - 1 \quad \text{if } LQ_i \leq 1.00$$

$$m_i = (v_i/t_i - V/T) \;/\; (1 - V/T) \quad \text{if } LQ > 1.00$$

where: LQ_i = the location quotient for subregion i.

v_i = the amount of variable v, e.g., manufacturing employees, in subregion i.

t_i = the amount of the referent variable, e.g., workforce, in subregion i.

V = the amount of variable v in all the subregion ($V = \Sigma v_i$).

T = the amount of the referent variable in all the subregions ($T = \Sigma t_i$).

(6) The scale can be considered interval because plus and minus scores are the same relative scalar distance from complete dispersion (m=0.0) to their respective limits of +1.00.

(7) *Users Reference Manual for Synagraphic Computer Mapping Version V*, Laboratory for Computer Graphics and Spatial Analysis, Graduate School of Design, Harvard University, 1971.

(8) The formula for this is:

$$M = \frac{\sum_{i=1}^{n} m_i}{n}$$

where m_i is the m-score for the ith subregion and n is the number of subregions.

(9) Ferguson, G. A., *Statistical Analysis in Psychology and Education*, McGraw-Hill, New York, 1966, pp. 185-188.

(10) This is the standard error of Rho. See Ferguson, *op. cit.*, pp. 185-186.

(11) The mean deviation under discussion here is the standard deviation divided by the mean. As the spread of scores from the mean increases, the value increases.

FUNCTIONAL COMPONENTS OF THE FERROUS SCRAP INDUSTRY IN A SELECTED PORTION OF THE SOUTHEASTERN U. S.

*Paul Frederick Rizza**

In recent years, new electric steel mills have been built and total electric steel mill production has increased substantially in the southeastern United States. For several years, the Southeast has been an excess producer of ferrous scrap—the basic raw material used in electric steel mill production. *(1)* Ferrous scrap, particularly scrap steel, can be used in varying quantities in all types of steel-making furnaces: the open-hearth, electric, basic oxygen (BOF), and Bessemer. Only electric arc steel-making furnaces, however, are currently used in the area considered by this paper, and they are charged almost exclusively with steel scrap. Electric furnace steel producers depend almost exclusively on the scrap industry for their basic raw material. Purchased scrap consumption for electric mills ranges from 75 to 100 percent of the total scrap consumed, depending on whether or not mill-revert scrap is considered as a separate source. Cast iron is not purchased or consumed by steel mills. For the most part, it is bought and used by large foundries located in the Birmingham-Anniston, Alabama, area.

STUDY AREA. This paper focuses on the functional components of the ferrous scrap industry currently providing essential raw materials for five electric steel mills located in three Southeastern states. These five steel producers are located in a relatively compact geographical area within Georgia, South Carolina, and North Carolina. Since all five mills are electric, they are dependent on ferrous scrap as a raw material. The outer boundary of their collective raw materials supply area thus serves as the study area boundary (Figure 1). *(2)* The study area encompasses a region that contains all the functional components found in the American scrap industry today. Each state within the study area is an excess producer of ferrous scrap and ships its surplus to domestic deficit regions and abroad.

PURPOSE. The primary purpose of this paper is to accurately describe the functional hierarchy of the ferrous scrap industry. Although the steel industry has been the focus of research by many scholars, the ferrous scrap industry has been largely ignored. Little has been written concerning the ferrous scrap industry's functional and spatial organization or its raw material flow patterns. This complex industry funnels small

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quantities of areally dispersed ferrous wastes into capital intensive processing facilities which, in turn, supply the electric steel mills. Carlson and Gow recognized the lack of attention given to the ferrous scrap industry in 1936.

> Little has been said about the scrap iron and steel industry. However, it supplies approximately one half of the raw materials of the steel industry. It thus ranks with pig iron as an immediate source of our steel products . . . . The scrap iron and steel industry is a fundamental part of our industrial structure. *(3)*

In 1955, Pounds also recognized the importance of the industry and emphasized technical, economic, and conservation advantages that could

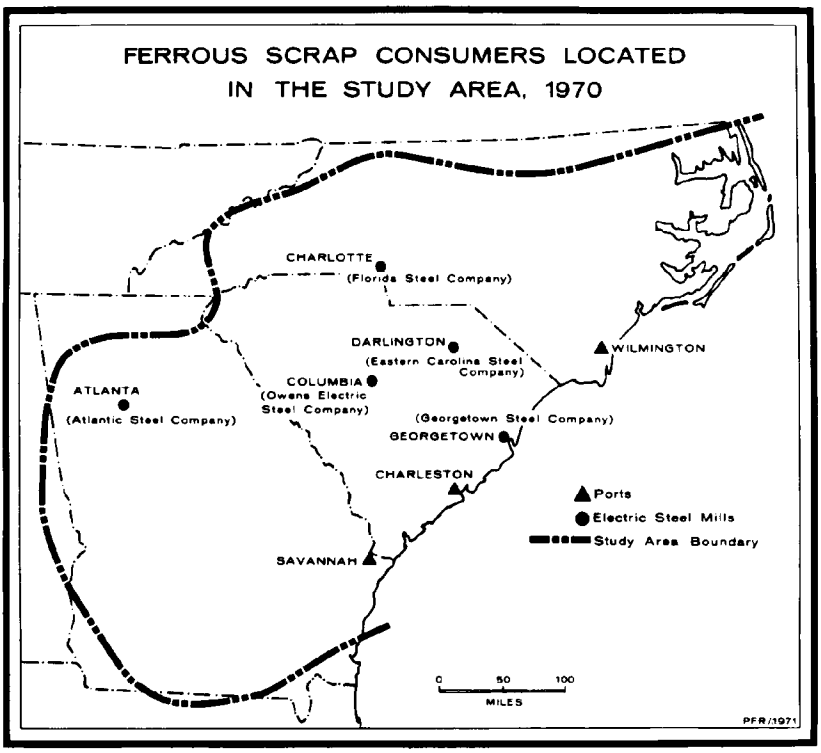

Figure 1

be derived from increased use of ferrous scrap by steel producers. *(4)* Today, ferrous scrap recycling remains economically significant to the steel industry, and indeed, to the entire economy. The importance of

ferrous scrap as the basic raw material input for electric steel-making, and the paucity of studies pertaining to it, suggests the need for careful study of this fascinating and complex industry.

FUNCTIONAL COMPONENTS OF THE FERROUS SCRAP INDUSTRY. Once generated, scrap must enter the recycling process, become a nuisance to society in the form of solid waste, or be lost forever in landfill projects. The recycling of scrap is limited by critical economic factors. The cost of buying, transporting, and processing scrap, as well as current market prices for the grade produced, determine which scrap will be recycled. The purpose here is to accurately describe the functional components of the scrap recycling process.

The ferrous scrap industry has a distinct structure of functional components that work in concert. Collectors, dealers, dealer-processors, and brokers are the major components of the ferrous scrap industry; yet these functions often overlap. Ferrous scrap does not always progress through a logical sequence from generation to consumption. In many cases, alternative flows through functional components are evident and frequently some components are bypassed. These alternative flow patterns and overlaps of functions create a complex picture of scrap movement within the industry.

Collection. Ferrous scrap collection is performed by every element in the industry. Collection, however, varies in importance from a peripheral to a primary function for each industry component. Many brokers, processors, and dealers collect and haul sizeable quantities of scrap aggregated by industries and businesses of all sorts. The professional collectors or scrap peddlers are primarily concerned with obsolescent scrap. These peddlers are small entrepreneurs who gather mixed loads of waste materials and truck them to local dealers or processors. *(5)* They aggregate and haul small amounts of spatially dispersed metallic wastes from dumps, garages, construction and demolition sites, small metal working shops, farms, or any other available source—provided it is economically feasible to do so. In recent years, the full-time peddler has been declining in number and importance. Principal reasons cited for this decline include: 1) fluctuating and frequently depressed market prices for ferrous scrap, 2) increased costs of operating trucks and a shortage of dependable labor, 3) a need for more expensive and efficient equipment to lower handling costs, and 4) more remunerative and dependable jobs outside the scrap industry. *(6)*

Some former peddlers still function as collectors on a part-time basis. These are normally one man operations where weekends or spare hours are spent collecting mixed loads for local dealers. A pickup truck is usually the major piece of capital equipment. In rural areas, farmers often serve as part-time collectors during their slack seasons. As Charles Lipset notes,

> Farms provide a steady flow of scrap, chiefly to small town yards. It is not unusual for a farmer to take a load of scrap to the local dealer in the spring when he goes to town for his seed and fertilizer, and again in the fall when he puts in his coal for the winter. *(7)*

In general, part-time collectors appear to be more numerous than full-time collectors. The "in and out" collector phenomenon was often described during field interviews. Many scrap dealers and processors state that when demand for scrap is strong, there is a corresponding increase in the number of peddlers. When prices drop there is a decrease in the number of peddlers.

A few capital intensive collectors serve large processors in metropolitan areas. They operate a small fleet of trucks, sometimes a portable car crusher, and occasionally a mobile crane. In some cases, processors help finance the equipment necessary for economically efficient collection in order to insure a steady supply of scrap for their processing facility. However, this is not a common or widespread practice.

Buying, Selling, and Processing. Buying, selling, and processing functions are performed primarily by dealers and processors in the ferrous scrap industry. However, the functions of both dealers and processors are performed at the same location: a scrap yard. The dealer may buy scrap across his scales from peddlers, from industry, or from individuals. In each case, his scrap yard serves as a point of aggregation for purchased scrap. After scrap enters the yard, it is normally segregated and classified according to type of material, processed, and reloaded for shipment to consumers. It is the degree of processing within a yard that differentiates the scrap dealer from the processor. All scrap processors interviewed are dealers in the sense that they purchased scrap, but not all dealers are processors.

Table 1 presents a list of the primary functions identified by scrap yard spokesmen within the study area. The difficulty in separating the dealer and processor functions is obvious. Of 105 yard operators interviewed, only three claimed to be dealers solely, and only two were solely processors. On the other hand, 92 yards performed multiple functions, while identifying either dealership or processing functions as foremost. The dealership function was dominant in 52 yards, while processing was dominant in 40 yards. It is important to note that differences in functions do exist, although both functions are normally conducted at the same location.

Once scrap enters a yard it is segregated, classified, and processed. The processing function is, in effect, a form of manufacturing. *(8)* Ferrous materials are shredded, cut, and baled to meet the specifications of consumers. A variety of expensive and sophisticated equipment is used for processing ferrous wastes. Cranes, magnets, alligator and guillotine

shears, shredders, baling presses, and incinerators are typical examples of equipment used for preparing scrap. The use of such equipment makes the processing function the most capital-intensive segment of the

TABLE 1

PRIMARY FUNCTION OF FERROUS SCRAP YARDS IN GEORGIA AND THE CAROLINAS, 1970

Primary Function	Number of Yards
Dealer	3
Processor	2
Dealer-processor	49
Processor-dealer	32
Dealer-processor plus a third function	3
Processor-dealer plus a third function	8
Other, with dealer or processor as a secondary function	8
Total	105

Source: compiled by the author from field interviews, 1970-1971.

industry. In 1967, the approximate cost of equipping a small scrap yard in a competitive area was $250,000. *(9)*

Dealer-processors are normally located in urban areas. Figure 2 indicates the distribution of scrap yards within the study area. Most yards are adjacent to sizeable population concentrations which generate sufficient scrap to make the processing function economically viable. Proximity to raw scrap sources is an obvious first consideration for dealer-processors. Large metropolitan areas frequently support several processing yards, while smaller urban centers may support only one or two. The Piedmont, more heavily industrialized than the Coastal Plains or the Appalachian segment of the study area, supports a larger number of processing operations than do the other two physiographic sectors.

Dealer-processors serve as foci for the aggregation and processing of ferrous scrap. Each yard serves as a node for an area from which scrap is collected and funneled into the processing segment of the industry. The approximate area served by each yard, its raw material supply area, is presented in Figure 3. In towns containing two or more dealer-processors, the supply areas represent the averaged draw-areas of the operators involved. In general, the larger cities have a larger raw material supply area and a greater number of scrap yards. The more heavily industrialized Piedmont has the greatest concentration of scrap yards and is adequately serviced by several dealer-processors.

Brokerage Activities. The brokerage function is performed primarily by

brokers and sub-brokers. Both receive a brokerage fee for services, usually payable on a tonnage basis. A major difference between the two is in the quantity of scrap purchased and the areal extent of their operations. A broker purchases scrap from several yards scattered through

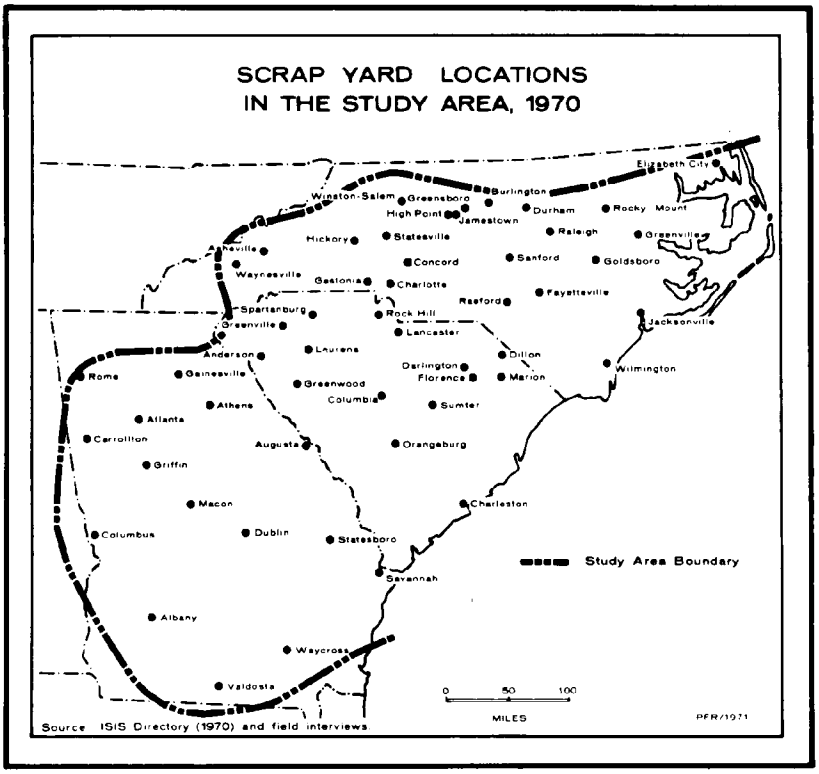

Figure 2

a large area for a major consumer, such as a steel mill. On the other hand, a sub-broker purchases scrap in a smaller area and from fewer yards. The sub-broker rarely sells directly to the consumer but rather to another broker—hence the term "sub-broker." Figure 4 indicates the distribution of brokers and sub-brokers operating in the study area during 1970.

Brokers perform many valuable services for both dealer-processors and consumers (mills and foundries). These include: 1) financing dealer-processors, 2) advising dealer-processors on market conditions in reference to the type of scrap demanded and when to sell, 3) informing dealer-processors about innovative processing techniques and new equip-

ment, 4) locating favorable markets for dealers' scrap and finding markets for new products, and 5) handling the shipment of ferrous scrap from the yard to the consumer. *(10)*

The financing function performed by brokers is the single most important service. When the broker purchases scrap from a dealer he

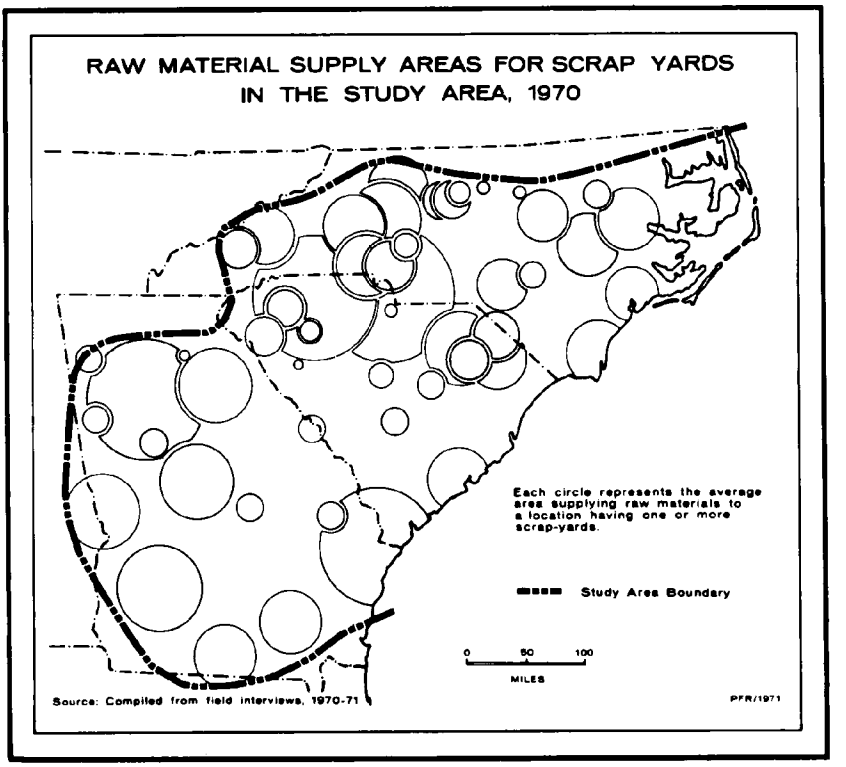
RAW MATERIAL SUPPLY AREAS FOR SCRAP YARDS
IN THE STUDY AREA, 1970
Each circle represents the average area supplying raw materials to a location having one or more scrap-yards.
Study Area Boundary
0 50 100
MILES
Source: Compiled from field interviews, 1970-71
PFR/1971

Figure 3

normally pays 75 to 90 percent of the scrap's value upon shipment from the dealer's yard. When the consumer accepts shipment and verifies weights (often several days after shipping) the broker pays the remaining price of the scrap. This financing service also extends to the consumer. Mills traditionally pay the broker 15 to 60 days after the scrap shipment has been accepted. In essence, the broker provides the money that allows scrap to flow from point of aggregation and processing to the point of consumption.

Brokers appear to have the organizational network and connections essential to keep themselves informed on happenings throughout the

scrap industry. Unlike many dealer-processors, they maintain an awareness of scrap needs and availability over a broad area. Ideally, brokers can satisfy the consumer's scrap requirements in terms of quantity and grade at the lowest cost.

Brokerage services performed for ferrous scrap consumers include: 1) short-term financing, 2) advice on market conditions, 3) mill inventory

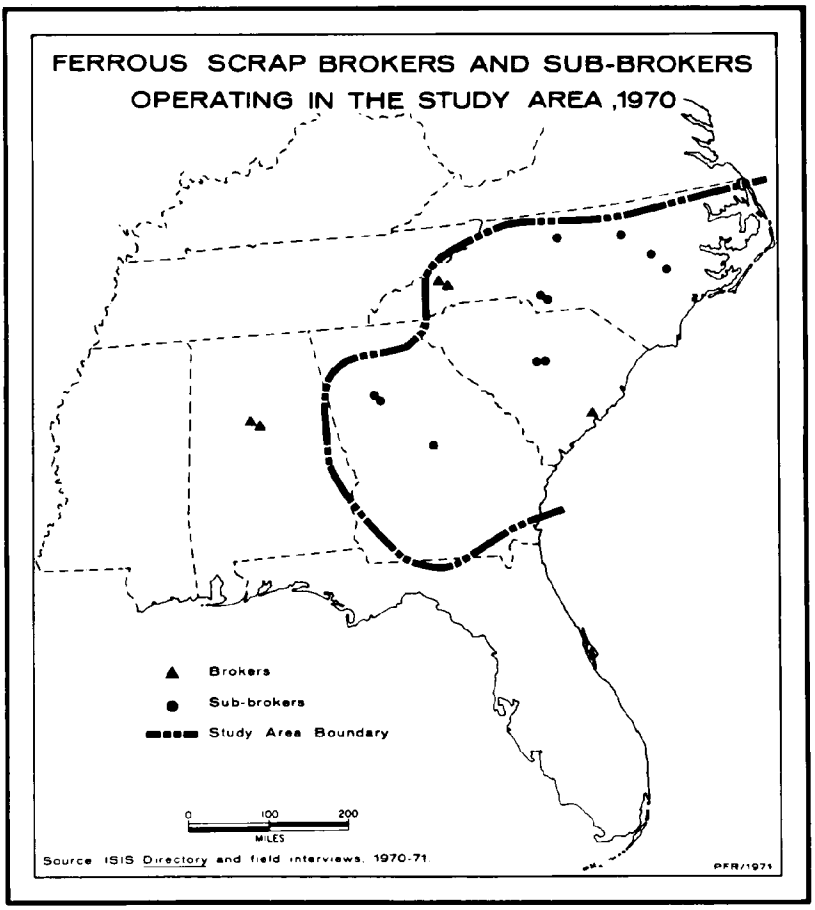

Figure 4

surveys, 4) provision of metallurgical experts to help solve problems at mills and foundries, 5) funneling large tonnages of scrap from areally dispersed processors to a central consuming point, and 6) handling freight claims. Brokers occasionally provide specialists for consumers in

an effort to solve their scrap-related problems. If a mill or foundry has difficulty utilizing certain grades of ferrous scrap in its furnace, a metallurgist may be provided by the broker to help remedy the problem. Brokers also have hired surveyors to determine tonnages of scrap stockpiled at mills and foundries. When a consumer rejects a scrap shipment because of excess dirt or improper grading, the broker has the responsibility of returning the shipment or making a proper adjustment.

The brokerage function is in large part performed for the convenience of the consumer. Brokers know the consumer's needs and maintain close contacts with dealer-processors. When the consumer needs scrap, he can place an order with a broker rather than deal directly with several dealer-processors or sub-brokers. Thus, the problem of aggregating large tonnages of scrap for the mill from a number of dispersed scrap yards becomes a major function of the broker. For this service the broker receives a fee, usually a dollar per ton. *(11)* The brokerage fee is paid by the processor, not by the consumer. Thus, the brokerage fee is subtracted from the mill price and the dealer-processor actually receives fifty cents to a dollar per ton less than the consumer pays to the broker.

Approximately one dozen sub-brokers are active within the study area. They may act as an exclusive buyer for a medium size foundry or purchase scrap from satellite yards within a limited area. In many cases, sub-brokers must sell a significant portion of their scrap to other brokers who have exclusive agreements with large consumers. In this situation a yard selling through a sub-broker, who in turn sells through a broker, pays a double brokerage fee. In some cases, the sub-broker will handle a feeder yard's scrap at no cost to that yard. This is done only when the sub-broker wants to maintain the flow of scrap from smaller yards to his own yard.

The dual service function of the broker has been questioned by many dealer-processors. They often feel that the broker's first loyalty is to the consumer, and little serious attention is given to their problems. In some cases, larger dealers have been able to sell directly to mills and foundries, thus bypassing the brokerage function. Small and intermediate size yards, however, rarely can deal directly with consumers and need the broker—especially for the financing function.

Scrap Movement Within the Industry Hierarchy. The normal movement of ferrous scrap through the industrial organization is from source of generation to the collector, then sequentially to the dealer-processor, the broker, and finally to the consumer. As pointed out earlier, there are several alternative flows as well as functional overlaps that tend to complicate the normal pattern. In all cases, however, the functional components of the ferrous scrap industry work in concert to meet the needs of electric steel mills and exhibit a remarkable flexibility.

CONCLUSIONS. The study area traditionally has been one of excess scrap generation and low scrap prices. It seems reasonable to assume that these were important considerations in the decisions to establish new electric steel mills there between 1968 and 1970. During this period, two new electric mills were built: one at Darlington and another at Georgetown, South Carolina. Both mills were operating in 1970, and no shortage of scrap had resulted. In fact, the study area remains an excess producer of ferrous scrap.

The ability of the study area to meet current demand while shipping its excess production to other regions and abroad appears to make it attractive for new mills or for expansion in the capacity of existing facilities. The presence of the ferrous scrap industry, with its distinct functional and spatial components working in concert to purchase, process, and supply ferrous scrap to consumers (particularly electric steel mills), encourages this expansion. Collecting, purchasing, processing, transporting, and brokering of ferrous scrap are essential functions performed within the present industrial structure. It is this structured hierarchy and the productive flexibility of this dynamic and often ignored industry that not only permit, but encourage the expansion of electric steel-making in the study area. In short, the study area appears to have a viable scrap industry capable of supporting greater electric steel producing capacity; further expansion seems likely.

Finally, the study area appears to be the core of an extended "region" of scrap-dependent electric steel mill production. Based on 1970 information, it appears that electric mills were the only steel producing facilities in Virginia, Tennessee, North Carolina, South Carolina, Georgia, and Florida. These scrap-oriented mills constitute a unique areal component within the United States steel industry. They may well owe their existence to the scrap industry which provides the essential raw materials.

* * *

(1) Danielson, V. A., O'Neil, J. F., and Ahrenholz, *Iron and Steel Scrap in the Southeast*, U. S. Bureau of Mines Information Circular 8329, Government Printing Office, Washington, D. C., 1967, p. 33.
(2) The boundary was determined through interviews with steel mill spokesmen at each mill who provided a list of supply points where scrap shipments normally originated during 1970.
(3) Carlson, Albert S., and Gow, Charles B., "Scrap Iron and Steel Industry," *Economic Geography*, Vol. 12, 1936, p. 175.
(4) Pounds, Norman J. G., "World Production and Use of Steel Scrap," *Economic Geography*, Vol. 35, 1955, pp. 247-258.
(5) Barringer, Edwin C., *The Story of Scrap*, Institute of Scrap Iron and Steel, Inc., Washington, D. C., 1954, p. 27.
(6) These are the reasons most often stated by scrap yard spokesmen during interviews. Information for this and subsequent sections were derived from interviews with operators of 105 scrap yards located in the study area, 1970-71. To the author's knowledge, this included all active scrap yards in the study area.
(7) Lipset, Charles H., *Industrial Wastes and Salvage*, The Atlas Publishing Co., Inc., New York, 1963, p. 156.
(8) "Scrap is Not Junk," *The Enquirer* (Cincinnati), June 22, 1970, p. 6.
(9) Bennett, H., *Iron and Steel Scrap in the Inter-Mountain and Northwestern Plains States*, U. S. Bureau of Mines Information Circular 8344, Government Printing Office, Washington, D. C., 1967, p. 26.
(10) This list of activities was obtained from field interviews conducted with brokers in the study area, 1970-71.
(11) The "normal" fee is considered to be $1.00/ton by most people in the industry although sub-brokers often arrange deals for only $.50/ton.

LOCATIONAL STABILITY FACTORS IN THE MEN'S APPAREL INDUSTRY IN THE SOUTHEAST

*Merle C. Prunty and Carl F. Ojala**

In 1920, almost 80 percent of all men's garment production in the nation, and about 70 percent of the workers in that industry, were concentrated in nine cities in the northeastern quarter of the United States. *(1)* The state of New York alone contained some 2,537 men's apparel manufacturing establishments, or approximately half of the plants in the nation, and most of these were concentrated in New York City. *(2)* Fifty years ago, men's apparel manufacturing was insignificant among Southern industrial endeavors; Georgia, for example, contained less than one percent of all plants and all employees involved in the industry nationally. *(3)*

Since 1920, the industry has experienced a series of plant migrations to Southern areas which, coupled with the establishment of new firms of Southern origin, has resulted in reconcentration of the industry primarily in the South. Relocation and growth in the South has proceeded rapidly, especially since World War II, and Northeastern states (particularly New York) have decreased in both absolute and relative importance within the industry. Since 1960 it has, therefore, been generally recognized that the majority of the employment and most of the value added in men's apparel manufacture in the United States has been associated with plants located in the South. *(4)* The majority of employment in the industry occurs in the Southeast, i.e., south of the Ohio River and east of the Mississippi, excluding Florida (Figure 1).

Essentially, all studies that have examined the locational traits of the men's apparel industry in recent decades have concluded that labor cost has been, overwhelmingly, the cardinal locational force in the industry. *(5)* The authors also accept labor cost advantages in the South as a principal element in migration of many men's apparel plants into the Southeast, and in the rise of plants developed from regionally indigenous capital. It is, however, a crudely related view of the industry that generated the present analysis: the view of the industry as locationally unstable, populated by "fly-by-night" operatives who have exploited communities and employees by occupying community-supplied facilities only as long as free sites or local tax advantages or no local labor competition lasted—and who then moved on to another community that afforded a parallel set of advantages for exploitation. This view, quite widely held since World War II, has tended to represent the apparel

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industry as an undesirable element in the economic fabric of any Southern area. It has plagued firms that have specialized in industrial location services, local chamber of commerce and community officials and, particularly, most of the managerial cadre within the industry itself.

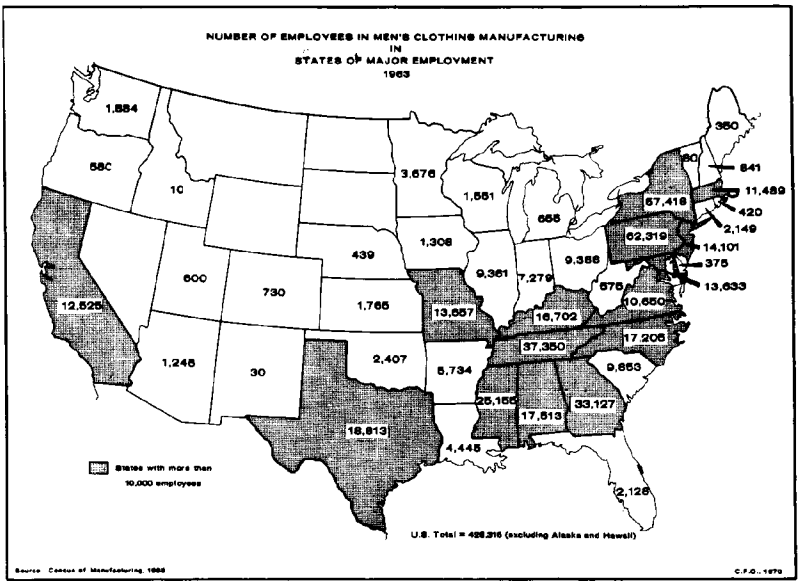

Figure 1

Both authors are aware of instances in the past in which fly-by-night plant operators did exactly what they have been charged with doing. These instances consist of a scattering of cases observed in Tennessee, Kentucky, Georgia, and the Carolinas. All were observed during the 1950's but not since then; the authors believe the fly-by-night label has had no validity in recent years. It is here postulated that the men's apparel industry has developed substantial locational stability because of distinctive locational advantages which the Southeast affords it, and that these same advantages should accrue to the industry for the foreseeable future. The postulate involved examination of 1) characteristic plant locations to assess relative cost advantages, 2) raw materials assemblage, linkage, and transport costs, 3) industrial inertia effects, and 4) the effects of Federal regulations. Examinations of these facets should demonstrate that if standardized wage rates should come about, as a consequence of nationwide unionization of the industry, the industry would remain predominantly in the South.

As a medium scale areal base for this study, industry in north Georgia was examined where 84 plants were distributed through 18

counties in 1969 (Figure 2). Many of the data were derived from managers of these plants by questionnaires and interviews; the remainder came from more conventional sources. This area was selected for intensive examination because of the excellent 1969 *Georgia Manufacturing Directory* (a source of information at a level of detail not approached by directories produced by neighboring states), the central location of north

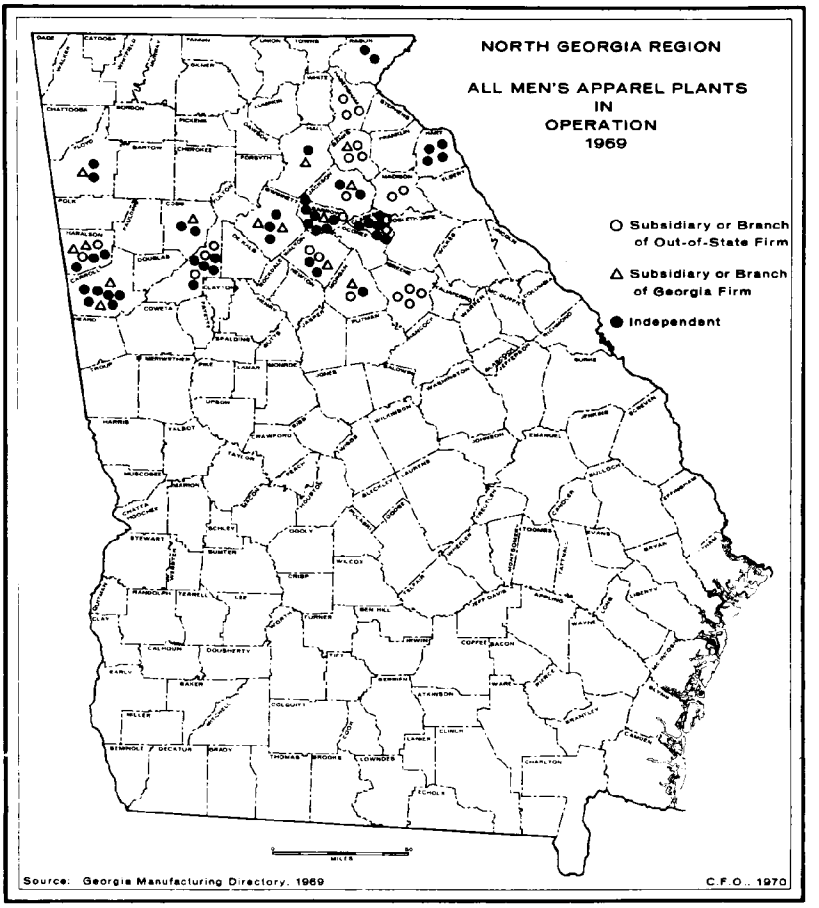

Figure 2

Georgia within the Southeast, and the parallels between traits within the industry in north Georgia and in the Southeast. Trait parallelisms involved sizes of establishments, numbers and types of employees, product types, ages of plants, and locations predominantly in small

towns—all discernible from the *Census of Manufactures* and state manufacturing directories. Thus, representation of the findings of the study as broadly applicable to the Southeast is deliberate.

MINIMUM AGGREGATE COST LOCATION: THE SMALL SOUTHEASTERN TOWN. The differentials in industry wage rates between representative Southeastern and Northeastern or Middle Western areas are evident from examination of Table 1. An Atlanta plant has had more than a 20 percent weekly wage rate advantage, for example, over plants in New York City, Rochester, Philadelphia, or certain plants in New Jersey. However, the differentials favoring Southeastern plants are even more striking for localities outside of Southern metropolitan areas. The average hourly rate of $1.90 for Georgia, rates of $1.82 for North Carolina and Mississippi, and $1.81 for Alabama, ranged from about 15 to 30 percent less than rates in Northeastern states. Since the data for these states *included* the metropolitan areas of each—where wage rates were higher than for the rest of the state—and since men's apparel plants in the Northeast are situated, overwhelmingly, in metropolitan areas but in the Southeast are predominantly in small towns, the wage rate advantages which have accrued to the characteristic plants in the Southeast have been somewhat greater than the table indicates.

Through interviews and questionnaires, it was found that in north Georgia in 1970 the average proportionate costs of producing a unit of goods were 39 percent labor, 45 percent raw materials, and 16 percent overhead. Profit margins reportedly ran from two to four percent, in addition.

Consider first the inter- and intraregional variations in labor costs. For this purpose, assume six plants, each employing 300 operators for 50 weeks yearly, and producing the same volume and types of goods (Table 2). Six locations are compared: Atlanta, Athens, and Greensboro, Georgia; and Rochester, N. Y., Chicago, Ill., and Los Angeles. Average hourly earnings are plant-wide averages. The labor cost advantages clearly accrued to the three Southeastern locations, which simply underscores a well-known situation: the unionized labor in men's garment plants in Los Angeles and Northern cities costs more than labor, mostly non-unionized, in the Southeast. Equally important, however, and less well-known, is the intraregional cost advantage that has accrued to the apparel plant in the small city. Atlanta, with more than 1,250,000 residents in its metropolitan area, was within the sphere of union organizing pressures by 1968; Athens-Clarke County had a population of about 55,000 in 1968 and experienced limited unionizing influences. But Greensboro, population 6,000, was free of unionization; the plant located there had limited competition for labor from other industries.

Although labor costs are not as large a proportion of production costs as are raw materials costs, they are far more variable from region

TABLE 1
AVERAGE WEEKLY AND HOURLY EARNINGS FOR MANUFACTURING EMPLOYEES IN THE MEN'S APPAREL INDUSTRY IN SELECTED STATES AND CITIES, 1968*

State	City	Average Weekly Earnings**	Average Hourly Earnings
Massachusetts		$ 78.89	$2.28
	Boston	83.55	2.45
New York (SIC 231)***		107.80	2.80
New York (SIC 232)		84.73	2.29
	New York City (231)	113.16	2.97
	New York City (232)	89.01	2.38
	Rochester	106.50	2.71
Pennsylvania (SIC 231)		96.94	2.62
Pennsylvania (SIC 232)		73.60	2.05
	Philadelphia (231)	103.32	2.80
New Jersey (SIC 231)		100.35	2.62
New Jersey (SIC 232)		86.71	2.27
Ohio		81.41	2.18
	Cincinnati	76.68	2.17
	Cleveland	91.41	2.44
Illinois		99.60	2.64
	Chicago	105.87	2.78
Missouri		74.62	2.05
	St. Louis	82.21	2.21
	Kansas City	84.54	2.20
Maryland		79.78	2.21
	Baltimore	83.65	2.33
Georgia		72.01	1.90
	Atlanta	79.71	2.12
North Carolina		65.16	1.82
Tennessee	Knoxville	75.50	2.08
Alabama		68.06	1.81
Mississippi		68.43	1.82
Texas		72.20	1.91
	Dallas	73.72	1.94
California (SIC 231)		86.45	2.37
California (SIC 232)		76.89	2.13

*Where not specified in the table, SIC 231 and SIC 232 are combined.
**Statistics presented in this table are not based on a 40 hour work week, but the average work week in all cases.
***Standard Industrial Classification (SIC) Code 231 refers to men's suits, coats, and overcoats. SIC 232 refers to men's furnishings, i.e., shirts, underwear, neckwear, trousers, and work clothes.
Source: United States Department of Labor, Bureau of Labor Statistics, *Employment and Earnings: States and Areas, 1939-1968*. Bulletin No. 1370-6, August, 1969.

TABLE 2

COMPARISON OF SELECTED PRODUCTION COSTS, SIX REGIONAL-INTERREGIONAL PLANTS, MEN'S APPAREL INDUSTRY, 1968 (STANDARDIZED PLANTS)

Locality:	Gr	At	Atl	LA	Ro	Ch
	(1)	(1)	(2)	(2)	(2)	(2)
Average Hourly Wage+Fringe Benefits:	1.98	2.10	2.42	2.55	3.01	3.08
Annual Wage Differentials for 300 Employees: (000's)	—	72	264	342	618	660
	(3)					
Overhead Costs: (000's)						
Building Rental	24*	24*	27	27	27	27
Machinery Costs	5*	6	6	6	6	6
Local Taxes	—	5	7	8	7	8
Fuel Costs	4	4	4	6	6	6
Overhead Differentials: (000's)	—	6	11	11	13	14

*Revenue Bonds.

Gr: Greensboro, Ga. *At*:Athens, Ga. *Atl*: Atlanta *LA*: Los Angeles
Ro: Rochester, N. Y. *Ch*: Chicago
Sources: (1) From interviews with plant officials, 1970.
(2) BLS Bulletin 1370-6, 1969.
(3) Fantus Co.: *Apparel Location Research*, Report #3, 1966.

to region than are raw materials costs. It is their interregional variations which have exerted influences favorable to men's apparel plant location in the Southeast. However, the intraregional variations in labor costs have exerted an equally distinctive influence. In 1929, Atlanta contained 36 percent of the north Georgia apparel plants, in 1949 only 17 percent, and in 1969 less than 10 percent of the 84 plants in the region. As the men's apparel industry grew in north Georgia, the new plants were situated in small cities because of the substantial labor cost advantages found in such places. The combination of interregional and intraregional labor cost differentials has worked, it appears, to make virtually any small Southeastern town much more attractive to the industry than any metropolitan area anywhere—including Atlanta, in the case of north Georgia.

Labor costs reflect, inherently, labor availability to some degree in virtually any industry. During the 1950's and 1960's when many new men's apparel plants were established in the Southeast, labor availability

in the small town setting was an important locational inducement. The available labor was by no means confined to the small town itself; during the 15 years after World War II the Southeastern states engaged in massive highway paving programs that resulted in the "black-topping" of essentially all secondary and most tertiary (or county) roads. A rural population whose diurnal mobility had been severely restricted found itself with a much greater range of area, and of employment choices, rather suddenly. From the viewpoint of the apparel plant seeking a small town location, the availability of labor from surrounding rural areas appears to have been as appealing as was the labor cost alone.

While labor is relatively immobile in a regional sense, today it normally is very mobile in a local sense. On the average, the north Georgia plants drew 75 percent of their labor from an area within a 16 mile radius of their plants; some employees in virtually every plant travelled twice that far in the daily journey to work. In one instance (Bowden, Ga.), the number of employees in the three men's apparel plants located there substantially exceeded the population of the small town itself. However, the attractiveness of small town sites in north Georgia has declined somewhat since 1968 because the underemployment and displacement of farm labor caused by recent mechanization in agriculture has largely disappeared. *(6)*

Overhead costs (building rental, local taxes, machinery amortization, fuel costs) did not vary greatly either inter- or intraregionally (Table 2). There were no significant interregional differentials in utility costs or inventory taxes, hence they were omitted. Again, least cost accrued to the small town site (Greensboro) while no important differential was evident among the sites in metropolitan areas. The advantage in overhead costs in the small town setting—perhaps as much as $14,000 yearly as suggested by the differential between Greensboro and Chicago—is small and easily could be offset by other production or marketing costs.

A typical locational profile, the characteristic north Georgia community in which a men's apparel plant is situated, emerged when community traits were aggregated and averaged (excluding metropolitan Atlanta). The typical location in 1970 was: in a town with a population of 4,800 within a county of 24,000 and a civilian labor force of 9,300, with total unemployment of only 280 workers (about 3.0 percent of the labor force); served by one Federal and two state highways but with no interchange on an interstate highway (the nearest interchange was 18 miles away); served by one rail carrier and seven interstate plus two intrastate motor freight carriers, including one carrier who maintained a local terminal; in a community containing 12 manufacturing plants (including one with some union labor affiliation), of which men's apparel manufacturers were among the three largest employers; about six tenths of a mile from the areal center of the community; at the center of an

area with a radius of 16 miles within which more than 75 percent of the plant labor force resided; and in a region from which goods in transit by motor freight required one day's travel time to Charlotte, N. C., or Birmingham, two days to Chicago, Miami, St. Louis, or New Orleans, or three days to Dallas or New York. Men's apparel plants were the major employers in 25 of the 39 communities aggregated to produce this profile (Figure 2). Throughout north Georgia, excluding Atlanta, the men's apparel industry accounted for 25 percent of employees in the whole industrial labor force.

The small town setting of the industry in north Georgia contrasts with the metropolitan setting of the industry in the Northeast as greatly as it is possible to imagine and represents the consequences of rational processes designed to identify minimum aggregate production cost sites.

RAW MATERIALS ASSEMBLAGE AND TRANSPORTATION COSTS. Men's apparel plants in the Southeast have an outstanding advantage in raw materials and transportation costs when the principal production cost variable—labor—is standardized. Assume a uniform cost of labor nationwide in the industry, perhaps through unionization. Essentially, variations in costs at which raw materials are available are consequences of variations in transport costs, since the nation's men's apparel plants purchase their piece goods, overwhelmingly, from Southeastern textile plants. Many textile plants are within a 250 mile radius of any apparel plant located along a line between Columbus, Georgia, and Raleigh, North Carolina; they are within easy overnight haul by truck. Motor carriers transport at least 90 percent of the nation's piece goods for apparel and finished apparel.

Interregional as well as intraregional freight rates favor the Southern apparel plant (Table 3). A Philadelphia plant, for example, must absorb more than twice the transport cost that applies to a plant somewhere near Atlanta, if buying from the same Southeastern textile mill. Motor freight rates on finished men's apparel also favor Southeastern locations; for example, it is cheaper to ship from Atlanta to Philadelphia than from Philadelphia to Atlanta (Table 4). *(7)*

However, the Southern apparel manufacturer is at a net disadvantage in reaching the Northeastern market simply because of distances. It is cheaper to ship from Philadelphia to Boston or Cleveland than from Atlanta. The Southern apparel manufacturer is not at as great a transport disadvantage in shipping into Northern markets as Table 4 suggests because of yet another factor: bulk reduction in manufacturing, which amounts to about 10 percent by weight. Thus, non-Southern producers are incurring hidden costs in piece goods transportation that partially offset their finished goods transport cost advantages in Northeastern markets. The Southern manufacturer, then, has clear-cut advantages in raw materials assemblage costs, and in transport-to-market costs, to all

TABLE 3

SHIPPING COSTS PER 100 POUNDS, TEXTILE PIECE GOODS, BETWEEN SELECTED POINTS, JANUARY, 1972

	100-1000 Lbs.	5000 Lbs. or more
Between any two N. Georgia points	$1.60	$1.15
Charlotte, N. C. to Atlanta	2.14	1.38
Charlotte, N. C. to Philadelphia	3.70	2.86
Philadelphia to Charlotte, N. C.	3.92	3.08
Atlanta to Philadelphia	4.74	3.40
Philadelphia to Atlanta	5.12	3.93
Atlanta to Chicago	4.47	3.19
Philadelphia to Chicago	4.56	3.40
Philadelphia to Boston	2.25	1.45

Source: Rate Division, McLean Trucking Co., Winston-Salem, N. C., Jan. 1972.

TABLE 4

SHIPPING COSTS PER 100 POUNDS, MEN'S APPAREL PRODUCTS, FROM ATLANTA AND PHILADELPHIA TO SELECTED POINTS, JANUARY, 1972

	100-500 Lbs.	1000-2000 Lbs.	5000 Lbs. or More
Atlanta to:			
Philadelphia	$ 5.34	$ 4.59	$ 3.85
New York	6.05	5.27	4.33
Boston	6.54	5.71	4.80
Cleveland	7.03	6.21	5.13
Los Angeles	13.10	11.89	10.71
St. Louis	6.50	5.72	4.70
Chicago	7.17	6.29	5.23
Philadelphia to:			
Atlanta	7.10	6.24	5.24
Boston	3.94	3.58	2.71
Cleveland	4.71	4.30	3.47
Los Angeles	16.89	15.34	13.81
St. Louis	8.38	7.22	5.99
Chicago	7.60	6.67	5.58

Source: Rate Division, McLean Trucking Co., Winston-Salem, N. C., Jan. 1972.

market areas outside of the Northeast and, as Hayes and Schul have noted, the industry has developed in the Southeast to serve not merely regional but primarily national markets. *(8)*

To what extent, then, is the Southern apparel manufacturer at a disadvantage in marketing his products in the Northeast? Consider the situation in terms of aggregate transport costs, again based on a standardized pair of plants each of which employs 300 operatives to produce the same goods. The two plants are located on the outskirts of Philadelphia and Atlanta (Table 5). Since labor costs are standardized for this comparison, they are omitted from consideration. Plants of this size consume, on the average, piece goods (weighing 10 oz. per yard) at the rate of

TABLE 5

RELATIVE AGGREGATE TRANSPORT COSTS TO CLEVELAND AND BOSTON MARKETS FOR THREE STANDARDIZED MEN'S APPAREL PLANTS,* 1972, 5000 Lb.+Rates**

	*N. Georgia Plant****	*Philadelphia Plant*
To Cleveland Market:		
Piece goods transport: (900 tons)	——	$ 44,050
Finished goods transport: (810 tons)	83,160	56,214
total:	$ 83,160	$100,246
To Boston Market:		
Piece goods transport: (900 tons)	——	$ 44,050
Finished goods transport: (810 tons)	77,760	43,902
total:	$ 77,760	$ 87,952

	N. Georgia Plant	*Boston Plant*
To Boston Market, N. Georgia vs. Boston Plant:		
Piece goods transport: (900 tons)	——	$ 66,600
Finished goods transport: (810 tons)	77,760	——
total:	$ 77,760	$ 66,600

*Plants employing 300 laborers, full work schedule, gross raw material tonnage: 900 tons.
**Rates from Tables 3 and 4; total plant output assigned to the market indicated.
***Rates based on Atlanta.

about 900 tons per year. *(9)* Assume that both plants purchase their piece goods from textile mills somewhere in north Georgia. The differential in delivered cost of raw materials (at the 5,000 lb.+rate) favors the north Georgia manufacturer by $40,050 in direct costs and an additional $4,000 in hidden (bulk reduction) costs. *(10)* Put another way, the Philadelphia manufacturer pays about $44,000 more annually for raw materials needed for his finished product than does his north Georgia competitor.

A north Georgia mill has absolute freight rate advantages, in addition, in delivering finished goods to all parts of the nation west of Ohio and south of about the Virginia line. However, when *total* transport costs for both raw materials and finished goods delivery are calculated, the raw material advantage of the Georgia mill places it in a strongly competitive position even in Northeastern markets (Table 5). The tabulation assigns the total output of both the Atlanta and the Philadelphia mills to, first, the Cleveland market and then to the Boston market. *(11)* Obviously the Atlanta mill retains some of its initial advantage in raw materials assembly costs through to the ultimate market in both instances. In Northeastern markets, men's apparel plants in such areas as Pennsylvania do not have the market advantage in competition with Southern producers that the concept of intervening market location is supposed to give them. Only if a plant is located on the northeastern side of the northeastern area, as in the Boston area itself, does it obtain a total transport advantage over the north Georgia producer.

Several points emerge. 1) Southeastern men's apparel plants, as represented by those in north Georgia, have interregional cost advantages of importance *beyond* that supplied by their well-known "edge" in labor costs. These advantages lie, particularly, in raw materials assembly and market delivery costs. 2) The raw materials cost advantage stems in part from the industrial linkage effect derived from location amidst the primary textile mill region of the nation, but also in part from favorable intraregional motor freight rates. 3) The favorable market delivery costs position stems in part from a 10 percent reduction in bulk during manufacture, coupled with interregional motor freight rates on finished goods that, again, favor the Southeast. 4) The favorable net cost of delivery which accrues to the Southeastern apparel producer enables him to carry the whole production cost advantage from lower labor costs into virtually all of the Northeast except, apparently, New England. Even there he is quite competitive. 5) If wage rates in the apparel industry were the same nationwide, i.e., if the Southeastern producer lost his present labor cost advantage, his position in the national markets would remain highly competitive because of his advantages in overhead costs and particularly in transport costs of all types. As Hayes and Schul said, the industry is serving national markets. These include the Northeast.

ATTRIBUTES OF INERTIA. An increasingly important industrial inertia was indicated for the industry in the Southeast by examination of

the north Georgia plants. The numbers of establishments and employees, and the value added by the industry have been growing, relative to men's clothing manufactures in other regions. Plants have not been leaving the area. In north Georgia, 43 percent of the present plants began operations prior to 1950 (30 percent were in operation before World War II) and 80 percent of the employees in 1970 were in plants more than 10 years old. Forty-five percent were employed in factories established by the time of World War II. Excluding metropolitan Atlanta and its highly diversified suite of industries, 10 percent of all industrial establishments in north Georgia were producing men's apparel in 1970, 25 percent of the employees in manufacturing were in this industry, and approximately 20 percent of the total value added by manufactures came from the production of men's clothing.

More than two thirds (approximately 70 percent) of the plants in north Georgia were locally owned (Figure 2). These ownerships consisted of two easily identified groups. The first consisted of men (or families) who were natives of Georgia and who had developed their factories from indigenous capital; they accounted for slightly less than half of the locally owned plants. The second group consisted of individuals or small privately held corporations that had abandoned locations in the Northeast and moved to Georgia. Both of these groups of successful entrepreneurs have tended to be locationally stable. The sizes of plants and volume of capital invested have increased substantially since initial plant establishment, in most cases in both groups; the commitments to existing locations have grown. The remaining 30 percent of the plants are properties of companies that are headquartered outside of Georgia, principally in the Northeast. These plants represent considerable investments and have remained at the initial locations selected for them.

A general assumption (rarely wholly correct) has existed to the effect that those manufacturers serving national markets who migrated to the South prior to World War II did so to take advantage of relatively low wage rates in the region. This assumption was modified after World War II to assert that manufacturers were then migrating into the South to take advantage of a "new," expanding market that was resulting from agricultural transformations, rapid urbanization, and growing per capita incomes in the region. *(12)* Hayes and Schul asserted that "these assumptions . . . have been simplified to the point of error." *(13)* The performances of plants in north Georgia support their view; 68 of the 84 plants in the area have been producing apparel overwhelmingly destined for national markets. Of the remaining 16 plants, those that have concentrated on the regional market, eleven began production after 1960. There has been sufficient time since World War II for other regions or localities in the nation to evolve locational traits attractive to the industry, if that

were going to happen. That plants established most recently are the main ones that have concentrated on the regional market highlights a region-wide inertia. Domestic markets for men's apparel tend to grow in direct proportion to the growth of the male population. *(14)* During 40 years of national market growth, the industry has steadily expanded in the Southeast—and in no other region—through plant in-migrations and local start-ups.

FEDERAL REGULATIONS AND POLICIES. Prior to 1959, pro-union agitation in some parts of the nation led to plant close-downs and actual migrations of plants to new locations where unions were not active. Also, it was during the 1940-1960 decades that fly-by-night operators were most active, though this group rarely moved solely in response to unionizing activities. However, the National Labor Relations Act was amended by the Congress in 1959 to make unwarranted plant close-downs an unfair labor practice and a federal offense. *(15)* Under the act, a company must operate at a loss for more than two successive years before it can cease operations at a particular plant. The effect of the amendment has been to enhance the locational stability in the Southeast that the apparel industry already was demonstrating. The amendment effectively eliminated the possibility of actions designed mainly to exploit a local labor force or a community.

Competition from foreign manufacturers who shipped into the United States market has been a growing, frequently the major, concern of domestic manufacturers since 1960. Imports have come principally from East Asian areas in which labor costs have been low: Japan (including Okinawa), Taiwan, Hong Kong, Singapore. Interviews with north Georgia plant operators in 1970 produced emphatic expressions of concern in nearly all cases. The severity of the problem was underscored when several owners revealed that they were actively investigating the possibilities for establishing plants in several East Asian locations, from which they would expect to ship men's apparel back into the United States. At least two firms had gone as far as examining potential plant sites by 1972. Two north Georgia plant owners established branch plants in Puerto Rico during the 1960's. Several other Georgia manufacturers arranged to buy some of their product lines from Asiatic manufacturers. These products were brand-labeled and packaged at the Georgia plants and then marketed. Since this time, devaluation of the U. S. dollar has reduced the advantage which foreign manufacturers had in the American apparel market. Devaluation has eliminated interest in foreign plant sites among north Georgia firms since 1972; thus a threat to the locational stability of the industry apparently has vanished. *(16)*

CONCLUSIONS. The use of labor cost, alone, to explain the present locational pattern of the men's apparel industry appears to be simplistic, real though it is in its own way. The present locational pattern of the

industry has to be attributed to a cluster of regionalizing cost advantages, not just one. Location amidst the many textile plants that are its primary raw materials suppliers has provided the industry in the Southeast with a highly advantageous interlink in terms of production costs. Relative transport cost advantages, including favorable rates on piece goods shipments to Southern firms, are a critical part of the regionalizing cluster of advantages and have not received the attention they deserve. As the industry has expanded since World War II in the Southeast, it has consistently exhibited responses to minimum aggregate cost rationalizations in the sites selected for plants: the small towns. Many of these plants are virtually "factories in the country."

It is impossible today to visualize another region within the nation which could exert a long-term attraction to the men's apparel industry. Other regions contain small towns with labor available at reasonable costs, though probably not in the volumes found in the Southeast. But location in any other region would cost the plants their present advantages in raw materials assemblage from nearby textile mills and the other transport cost advantages they now have. Plants located in other regions would not be able to compete with Southern producers any more effectively than do Northeastern producers today. Thus, the locational inertia which the industry exhibits presently has a sound basis in cost of production and marketing attributes that are regionally distinctive. The attributes of inertia have been enhanced by the National Labor Relations Act of 1959 and, more recently, the possibility of plant migrations to foreign areas was dissipated by devaluation of the dollar.

Throughout the industry there is a persistent fear of labor unionization. The authors were told repeatedly that unionization would put the apparel plants out of business and cause the disintegration of the industry in the Southeast. However, several large unionized plants were observed (particularly in the Atlanta area, where site and overhead costs are relatively high) that have operated successfully since unionization occurred. It has been demonstrated that if wage rates should be standardized nationally through unionization, the principal variables in production costs then would be associated with raw materials assemblage and product marketing, i.e., transport costs. In these costs, the Southeast offers important advantages which enable a Southeastern plant to compete effectively throughout nearly all of the national market. Therefore, it can be concluded that 1) the present concentration of the men's apparel industry in the Southeast will continue even if the industry should undergo extensive unionization, and 2) the present attributes of locational inertia will be enhanced because 3) the industry will con-

tinue to expand in the Southeast in response to the growing national market which it serves.

* * *

(1) Meyers, R. J., "The Economic Aspects of the Production of Men's Clothing," unpublished Ph.D. dissertation, University of Chicago, 1937, pp. 32-33. The cities were New York, Chicago, Philadelphia, Rochester, Baltimore, Cincinnati, Boston, Cleveland, and St. Louis.

(2) United States Bureau of the Census, *Biennial Census of Manufactures, 1921*, Government Printing Office, Washington, D. C., 1924.

(3) *Ibid.*

(4) United States Bureau of the Census, *Census of Manufactures, 1958, 1963*, and *1967* (Preliminary Report), Government Printing Office, Washington, D. C.

(5) Sivin, L., *Men's and Women's Garment Industry in New York City*, Department of Investigation, City of New York, New York, 1940; Helfgott, R. B., "Women's and Children's Apparel," in Max Hall, (ed.), *Made in New York*, Harvard University Press, Cambridge, Mass., 1959, pp. 19-134; Kenyon, J. B., "The Industrial Structure of the New York Garment Center," in Thoman, R. S., and Patton, D., (eds.), *Focus on Geographic Activity: A Collection of Original Studies*, McGraw-Hill Co., New York, 1964, pp. 159-166; Cobrin, H. A., *The Men's Clothing Industry: Colonial Through Modern Times*, Fairchild Publications, Inc., New York, 1970; Goodman, C. S., *The Location of Fashion Industries, with Special Reference to California Apparel Market*, School of Business Administration, Bureau of Business Research, University of Michigan Press, Ann Arbor, 1948; Meyers, R. J., *op. cit.*; see also Alexandersson, G., *Geography of Manufacturing*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1967, pp. 97-103; Miller, E. W., *A Geography of Manufacturing*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1962, pp. 57-60; Miller, E. W., *A Geography of Industrial Location*, William C. Brown Co., Dubuque, Iowa, 1970, pp. 114-121.

(6) The Atlanta regional office of the Bureau of Labor Statistics has issued a series of reports since 1969 which have indicated that the north Georgia, north Alabama, and Piedmont areas of the Carolinas have had unemployment rates ranging from 2.8 to about 4.0 percent, far lower than in most other sections of the nation. The coastal plains sections of the Southeast, on the other hand, have been experiencing higher unemployment rates. This leads the authors to surmise the small towns on the coastal plains will be more attractive to new apparel plants in the future than towns on the Piedmont and in Appalachia generally.

(7) Apparently the fact that there are some differentials in freight rates that favor Southern industrial products is not well known. The literature treating freight rate differentials had, for the past 40 years at least, stressed freight rate discriminations that favored Northern industries. The authors have not examined rate structures for industries that predominate in the South but believe that such an investigation could identify other industries that possess locational advantages because of "pro-Southern" freight rate advantages.

(8) Hayes, C. R., and Schul, N. W., "Why Do Manufactures Locate in the Southern Piedmont?" *Land Economics*, Vol. 44, February, 1968, p. 117.

(9) Mr. J. J. Wilkins, III, President, Wilkins Industries, Inc., Athens, Ga., June, 1972, interview.

(10) Motor freight rates employed here, and throughout the discussion, were supplied by the Rate Division, McLean Trucking Co., Winston-Salem, N. C., January 1972.

(11) The reader will recognize these comparisons as point-to-point simulations extrapolated from the linear programming model of transportation. It was frustrating to have to conclude that it was impossible to examine commodity flows in the men's apparel industry through use of linear programming models. Industry-wide data do not exist in anything remotely approaching reliable form; therefore, use of linear programming modes was impossible.

(12) Prunty, Merle C., "The Agrarian Contribution to Recent Industrialization in the South," in Heyl, R. J., (ed.), *The South: A Vade Mecum*, Association of American Geographers, Atlanta, 1973, pp. 107-118; McLaughlin, G. E., and Robock, S., *Why Industry Moves South*, National Planning Association, Committee of the South, Report No. 3, Washington, D. C., June, 1949, p. 67.

(13) Hayes and Schul, *op. cit.*, p. 117.

(14) Business and Defense Services Administration, U. S. Department of Commerce, *Outlook for the Textiles and Apparel Industries in 1975 and 2000*, Textile and Clothing Division, Washington, D. C., April, 1961, p. 32.

(15) In addition to plant close-downs or migrations, a number of unfair practices by unions are treated in the 1959 amendment. National Labor Relations Board, *Summary of the National Labor Relations Act as Amended, 1959*, Washington, D. C., 1959.

(16) We have not resurveyed the north Georgia firms since devaluation occurred. Our information regarding proposed foreign plant sites came from owners of three relatively large apparel firms whom the authors have known well for several years. These men possess an impressive knowledge of their industry.

INDUSTRIAL PARK OCCUPANCY AND COMMUNITY SIZE IN EAST TENNESSEE

*Daniel B. Good**

The last quarter century in the U. S. has been characterized by accelerated urban-industrial growth and decentralization of economic activity. A number of new urban facilities have developed to accommodate such growth, including shopping centers, self-contained communities, apartment communities, office parks, and industrial parks.

Liston placed the number of industrial parks in the United States prior to 1950 at "probably less than one hundred." *(1)* Boley, writing in 1961, estimated the number of "so-called planned, or organized, industrial districts" in the United States and Canada (Canada representing about 3 percent of the total) as over 1,000, but in the same paragraph qualified this by stating that there were probably fewer than 600 "bona fide" industrial parks as of July, 1960. *(2)* He also noted that over 80 percent of these had been established since 1949. *(3)* Boley's estimate that fewer than 120 parks existed in 1949, was near the figure given by Liston.

In contrast to the scarcity of industrial parks prior to 1950, the 1970 edition of the *Site Selection Handbook* lists more than 2,400 industrial parks in the United States and classifies them by deed restriction and facilities. *(4)* Because this listing is for the benefit of those interested in locating firms in industrial parks, it is unlikely that parks which have achieved full occupancy would be included. Consequently, the number of industrial parks in the United States, filled and developing, was likely to have exceeded 2,400 in 1970. This represents a twenty-fold proliferation of industrial parks in a twenty year span.

While industrial parks were associated primarily with large metropolitan areas prior to 1960, the greatest numerical increase since that time has occurred in cities of from 10,000 to 25,000 population (Table 1). The second largest increase has been in municipalities between 25,000 and 50,000 population. While the number of industrial parks in municipalities of under 5,000 population increased by 1900 percent between 1960 and 1970, the increase was only 44 percent in cities over 250,000 population.

STUDY AREA. In an effort to determine the success of industrial parks, particularly in small towns, an investigation was made of industrial parks in east Tennessee. There were 34 industrial parks in 21 eastern Tennessee counties in 1969 (Table 2 and Figure 1). Twenty-eight of the parks had been in operation since the beginning of 1959, and 25 were in incorpo-

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TABLE 1

NUMBER OF INDUSTRIAL PARKS IN URBAN AREAS IN THE UNITED STATES BY COMMUNITY SIZE CATEGORIES, 1960-1970

Date	Over 250,000	100,000 150,000	50,000 100,000	25,000 50,000	10,000 25,000	5,000 10,000	Less than 5,000	Total
1960	373	51	29	49	66	17	16	601
1970	530	270	270	390	480	200	320	2460
Numerical Increase 1960-1970	157	219	241	341	414	183	304	1859
Percent Increase 1960-1970	44%	430%	830%	696%	628%	1150%	1900%	310%

Source: calculated by the author from estimates by Boley, *op. cit.* and the *1970 Site Selection Handbook, op. cit.*

rated places with populations of less than 40,000. Incorporated places with industrial parks ranged in size from Decatur (1970 population, 698) to Knoxville (1970 population, 174,587). An additional park was established in the unincorporated community of Bean Station, located 46 miles northeast of Knoxville.

All 25 of the industrial parks in east Tennessee communities with less than 40,000 population were established in attempts to attract new manufacturing and create employment for surplus labor. Several state and Federal organizations such as the Tennessee Development Districts, the Tennessee Staff Division for Industrial Development, the Economic Development Administration, the Tennessee Valley Authority, and the Appalachian Regional Commission have actively encouraged and assisted in the establishment of industrial parks in rural areas. However, the co-chairman of the Appalachian Regional Commission warned that not all communities should invest in industrial parks; ". . . after all, a small community rarely can support more than a handful of industrial plants." *(5)* He also warned that officials in small communities should weigh carefully whether or not an industrial park can attract new manufacturers to east Tennessee.

Similar reservations were applied to Georgia in 1963 by Whitlatch. "It seems reasonable that most Georgia communities of less than 10,000 population cannot afford to risk investment in an industrial district." *(6)* And, further: "A population of 25,000 is an even safer average for the establishment of an industrial park although there are a few notable successful exceptions to this size limit in Georgia." *(7)*

In a 1956 study of industrial parks, Hackett questioned the success of such projects located in small communities.

> It is highly doubtful that sub-divisions (industrial parks) in the near or distant future could be profitably operated in small cities situated within sparsely populated areas . . . unless justification exists for the development, it cannot succeed; and the chief justification for its existence is a large number of people nearby. *(8)*

Confronted with the need to improve the economic plight of their communities, local officials and civic leaders are still being urged to sponsor or support industrial parks to attract manufacturing. Establishment of these parks, even when partly subsidized by a state or Federal agency, requires an outlay of local funds which communities can ill afford. Thus, community leaders need more information than is now available in order to make rational decisions concerning the potential benefits of investment in industrial parks.

ESTABLISHMENT OF INDUSTRIAL PARKS. Of the 25 industrial parks located in eastern Tennessee communities of less than 40,000 population, 18 were government sponsored, 5 were sponsored by private citizens, and 2 were jointly sponsored by a municipality, railroad, and

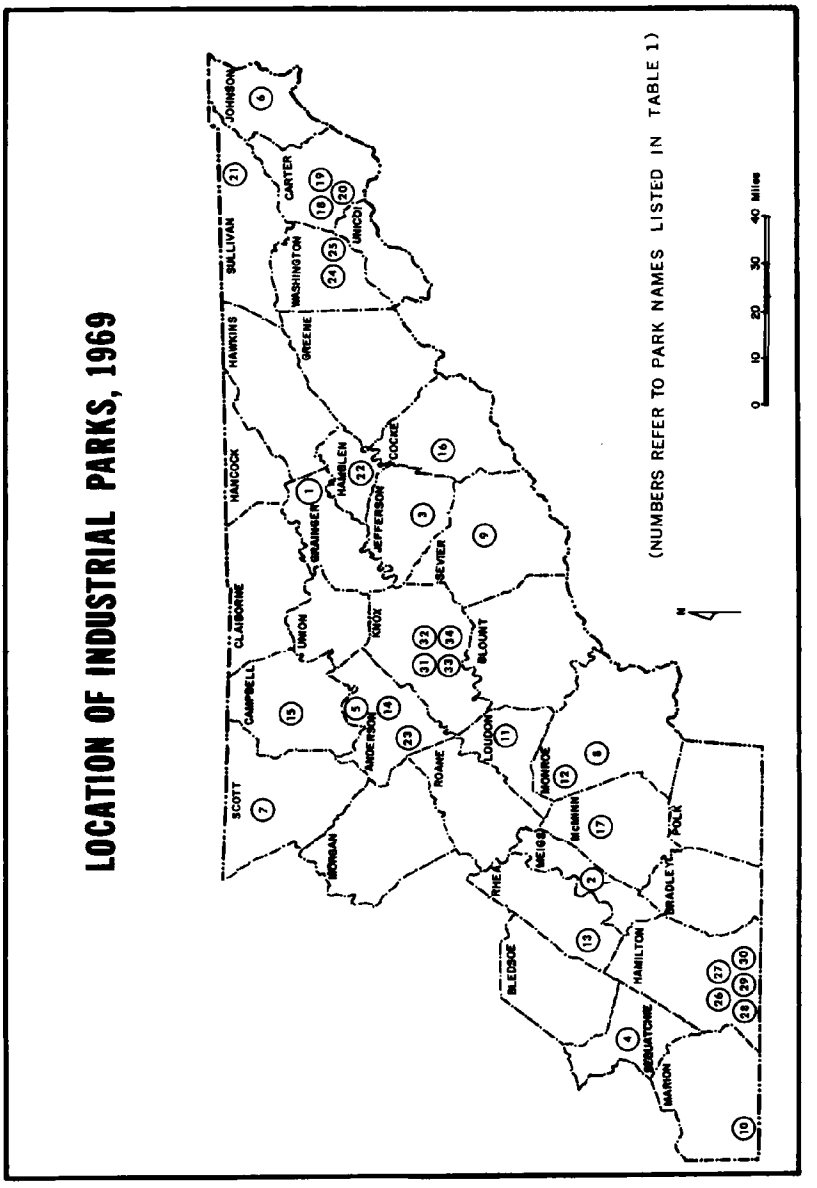
LOCATION OF INDUSTRIAL PARKS, 1969
(NUMBERS REFER TO PARK NAMES LISTED IN TABLE 1)
0 10 20 30 40 Miles
N
JOHNSON
CARTER
WASHINGTON
UNICOI
SULLIVAN
HAWKINS
GREENE
HANCOCK
CLAIBORNE
GRAINGER
HAMBLEN
COCKE
JEFFERSON
SEVIER
UNION
KNOX
BLOUNT
CAMPBELL
SCOTT
ANDERSON
ROANE
LOUDON
MONROE
MORGAN
MEIGS
RHEA
MCMINN
POLK
BRADLEY
HAMILTON
BLEDSOE
MARION

Figure 1

TABLE 2

LOCATION OF INDUSTRIAL PARKS IN EAST TENNESSEE ACCORDING TO COMMUNITY SIZE CATEGORIES, 1969

Number shown on Figure 1	Name of Park and Community Size*	Date Open
Communities Under 2,500 Population		
1.	Bean Station Industrial Park (Bean Station)**	1965
2.	Meigs County Industrial Park (Decatur)	1960
3.	Dandridge Industrial Park (Dandridge)	1966
4.	Sequatchie County Industrial Park (Dunlap)	1967
5.	Lake City Industrial Park (Lake City)	1966
6.	Johnson County Industrial Park (Mountain City)	1960
Communities Between 2,500 and 5,000 Population		
7.	Oneida Industrial Park (Oneida)	1958
8.	Madisonville Industrial Park (Madisonville)	1967
9.	Sevier County Industrial Park (Sevierville)	1963
10.	South Pittsburg Industrial Park (South Pittsburg)	1966
11.	Fort Loudon Industrial Park (Loudon)	1968
12.	Sweetwater Industrial Park (Sweetwater)	1966
13.	Dayton Industrial Park (Dayton)	1959
14.	Eagle Bend Industrial Park (Clinton)	1965
Communities Between 5,000 and 10,000 Population		
15.	LaFollette Industrial Park (LaFollette)	1954
16.	Cocke County Industrial Park (Newport)	1955
Communities Between 10,000 and 20,000 Population		
17.	Athens Industrial Park (Athens)	1962
18.	Old Industrial Park (Elizabethton)	1928
19.	Watauga Industrial Park (Elizabethton)	1967
20.	State Line Road Industrial Park (Elizabethton)	1962
Communities Between 20,000 and 30,000 Population		
21.	Bristol Industrial Park (Bristol)	1959
22.	East Tennessee Valley Industrial Dist. (Morristown)	1962
23.	Oak Ridge Industrial Park (Oak Ridge)	1966
Communities Between 30,000 and 40,000 Population		
24.	Rowe Industrial Park (Johnson City)	1963
25.	Clinchfield Industrial Park (Johnson City)	1955
Communities Over 100,000 Population		
26.	Shallowford Industrial District (Chattanooga)	1960
27.	Amnicola Industrial Park (Chattanooga)	1962
28.	Expressway Industrial Park (Chattanooga)	1963
29.	Airways Industrial Park (Chattanooga)	1964
30.	Shallowford Road L&N Industrial Park (Chattanooga)	1960
31.	L & N Industrial Park (Knoxville)	1961
32.	L & N Middlebrook Industrial Park (Knoxville)	1962
33.	Pleasant Ridge Industrial Park (Knoxville)	1956
34.	Forks-of-the-River Industrial Park (Knoxville)	1964

*There are no industrial parks in communities between 40,000 and 100,000 population.
**Includes Bean Station, unincorporated.
Source: personal interviews by the author.

private citizen group. *(9)* The other nine parks in the study are located in communities of over 40,000 population. Only two of these parks were community sponsored (local government and private citizen). Four of these parks were sponsored by real estate developers, whose primary motive was profit through the development and sale of industrial real estate. Three were sponsored by railroads which were more concerned with indirect profits from freight than with profits from the sale of land.

In general it is observed that in east Tennessee, industrial parks were established for two basic reasons: 1) community concern in areas of less than 40,000 population, and 2) profit motivation in communities greater than 40,000. Because the motives for industrial park establishment differ, the relative success of a particular park must be judged primarily with respect to the objectives which led to its development.

LOCATION OF INDUSTRIAL PARKS. Fifteen of the 21 counties that had industrial parks in 1969 possessed only one park; 12 counties had no urban place greater than 10,000 population. All six counties with more than one park had an urban place greater than 10,000 population. Hamilton and Knox counties contain the largest municipalities in east Tennessee, Chattanooga and Knoxville, respectively, and have the only major industrial park clusters in the study area (Figure 1).

Location of industrial parks varies by type of sponsor. Parks sponsored by real estate developers, whose primary objective is merchandising industrial land, are all confined to Chattanooga. *(10)* Approximately 75 percent of the occupants in real estate sponsored parks are firms that have relocated from the congested central portions of the city. *(11)* Railroad sponsored parks show similar orientation toward large urban centers. The sparseness of population and lack of large freight originators in small communities account for the absence of railroad sponsored parks outside Chattanooga and Knoxville. The only case where a railroad is a joint sponsor (with a local municipal government) occurs in Johnson City, within a densely populated and heavily industrialized area. *(12)*

Another jointly sponsored park (State Line Road Industrial Park) is located in Elizabethton (1970 population, 12,264). Although reasons for the joint sponsorship are not known, its establishment may have been prompted by success of the jointly sponsored park in Johnson City, only four miles away.

Fifteen of the 19 local government sponsored parks, representing 78 percent of the total, are located in communities with populations of less than 10,000. Four of the six private citizen sponsored parks are located in communities of less than 10,000 population. These four parks are examples of instances where groups of private citizens have taken action to promote community development when public leadership proved

uninterested in, or incapable of, generating public funds for such development.

In 1969, only the Forks-of-the-River Industrial Park on the fringe of Knoxville was outside the city limits of Chattanooga or Knoxville but within 20 miles of either city. These zones surrounding Knoxville and Chattanooga represent the cities' labor sheds. Industries locating in the zone would have had to compete over a distance for the metropolitan areas' labor supply. Furthermore, the small number of incorporated places within the 20 mile zone offered few instances of an organizational framework through which industrial parks might have been initiated.

More than 92 percent of the community sponsored parks (local government and private citizen) are found in communities of less than 40,000 population and more than 92 percent of these are located over 20 miles from the nearest metropolitan center. The surplus labor which has prompted most community sponsored parks is attractive to manufacturers whose locational decisions are based largely on the availability of low cost and relatively unskilled labor. Community sponsored parks will probably continue to develop primarily in small communities located at relatively great distances from metropolitan centers. Such communities seem to have a competitive advantage in attracting manufacturing over similar sized communities which can not or will not provide sites and services associated with industrial parks. *(13)*

DEGREE OF INDUSTRIAL PARK OCCUPANCY. The percentage of land sold or leased is an indication of a park's success. East Tennessee industrial parks had a mean occupancy rate of 56 percent in 1969, and over-all, most of them appeared to have met their principal aims. Occupancy rates among the 34 industrial parks ranged from 6 to 100 percent, indicating a wide variation in stage of development (Figure 2).

An important variable affecting the degree of occupancy is the age of a park. The coefficient of correlation between age of park and degree of occupancy in east Tennessee was +.42 indicating moderate association between the two variables. Industrial parks seven years of age or older (mean age 11.5 years) had a mean occupancy rate of 68.3 percent, while parks under seven years of age (mean age 3.6 years) had an occupancy rate averaging 43.9 percent. Only one park achieved full occupancy in less than seven years. One half of the parks over seven years of age were 75 percent or more filled and the other half ranged from 33 to 70 percent occupied. Size of the park is less well related to occupancy, for in all cases older parks achieved a higher rate of occupancy than younger parks (Table 3 and Figure 2).

Although there were exceptions, parks in large communities had a higher percent of occupancy than parks in small communities. The average percent of occupancy for all parks in communities of less than 10,000 population was 42 percent; in communities with a population of

between 10,000 and 40,000, 64 percent; and in cities of 100,000 population and over, the average was 68 percent. Occupancy apparently increased with increasing urban size primarily because the older parks were found in the larger communities. In addition, the demand for industrial land was greatest in large communities where suburbanization or industry was occurring and where labor, utilities, transportation, markets, and other community facilities were available in sufficient quantity and quality to meet the demands of industry.

TABLE 3

PERCENT OF OCCUPANCY COMPARED WITH AGE AND SIZE OF INDUSTRIAL PARK, 1969

Age of Park	Size of Park	
	176 Acres or Less	More than 176 Acres
Seven years old or less	49 (n=11)	36 (n=4)
More than seven years old	72 (n=13)	63 (n=6)

Source: computed by the author from data obtained through personal interviews.

Areas where parks were substantially occupied occurred (1) in the major urban centers of Chattanooga and Knoxville and (2) in the Tri-Cities area of northeast Tennessee. Five additional parks were highly occupied: one each in Scott, Campbell, Grainger, Sevier, and McMinn counties.

Seven of the nine parks in Chattanooga and Knoxville were more than 50 percent occupied. The seven parks averaged 7.8 years in age and were located where there was a high demand for industrial land. The two parks in Chattanooga and Knoxville with less than 50 percent occupancy (25 percent and 39 percent occupied) were five and nine years old, respectively. The younger park was exceptionally large (450 acres) and the older park was railroad sponsored with severe restrictions on selection of park tenants.

The high rate of occupancy of parks in the Tri-Cities area also resulted from the relatively old age of the parks and the large demand for industrial land in this urbanized area. Of the two Tri-Cities parks with low occupancy rates, one was sponsored by a railroad and a local government where tenant restrictiveness by the railroad sponsor was the probable cause for low occupancy. The other park was of recent establishment.

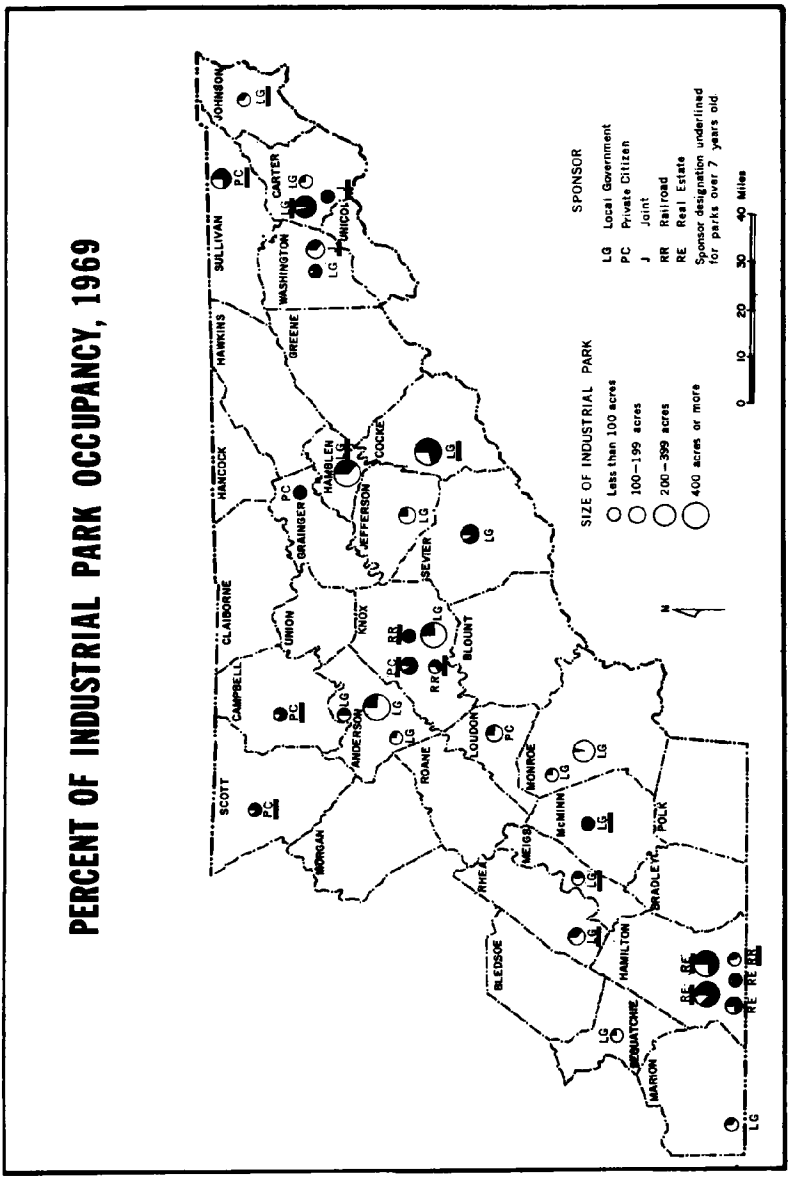
PERCENT OF INDUSTRIAL PARK OCCUPANCY, 1969
SIZE OF INDUSTRIAL PARK
Less than 100 acres
100–199 acres
200–399 acres
400 acres or more
SPONSOR
LG Local Government
PC Private Citizen
J Joint
RR Railroad
RE Real Estate
Sponsor designation underlined for parks over 7 years old
0 10 20 30 40 Miles
N
SCOTT
CAMPBELL
CLAIBORNE
HANCOCK
HAWKINS
SULLIVAN
JOHNSON
CARTER
WASHINGTON
UNICOI
GREENE
GRAINGER
HAMBLEN
COCKE
JEFFERSON
SEVIER
UNION
KNOX
ANDERSON
ROANE
LOUDON
BLOUNT
MORGAN
MONROE
McMINN
MEIGS
POLK
RHEA
BRADLEY
HAMILTON
BLEDSOE
SEQUATCHIE
MARION

Figure 2

The three parks in Scott, Campbell, and Grainger counties were 81, 77, and 100 percent occupied, respectively. The first two parks were 11 and 15 years old and the other park was only 4 years old. The parks were 52, 26, and 75 acres in size, indicating that small size and length of establishment were two significant factors affecting occupancy. The fully occupied park was at Bean Station, where proximity to the Morristown furniture manufacturing complex favored industrial development. All three parks were developed by private citizen groups who had to sell land or experience financial losses.

The only other two highly occupied parks in the study area were found in Sevier and McMinn counties. The parks were relatively old (six and seven years) and of moderate size (165 and 60 acres). In Sevier County, the county judge responsible for developing and promoting the park provided highly capable and energetic leadership in all phases of industrial park development. The Sevierville area also had an abundant labor supply and offered executive air travel and air freight facilities as locational amenities. Athens, the site of a fully occupied park, is located midway between Knoxville and Chattanooga where competition for labor is minimal, and the community is a major rail and highway center within the area.

Four of the five less well developed parks in Anderson, Jefferson, and Louden counties were three years old or less and the remaining park was only four years old (Eagle Bend Industrial Park). Consequently, the relatively short period during which these parks have existed appears to be the chief factor affecting percent of occupancy. The four year old Eagle Bend Industrial Park occupied a 600 acre tract, and its large size may also have contributed to the limited occupancy rate (25 percent). The park in Oak Ridge was in a community dominated by one large firm, Union Carbide, paying exceptionally high manufacturing wage rates. Thus, Oak Ridge has not been attractive to low-wage manufacturers.

Marion, Rhea, and Meigs counties also had low industrial park occupancy, perhaps reflecting their locations off major transportation routes, low levels of economic development, and absence of progressive local leadership. *(14)* However, two of the four parks had been in operation less than three years in 1969. The other two parks, in Meigs and Rhea counties, had been in operation nine and ten years, respectively.

Two Monroe County parks, less than three years old in 1969 and located in Sweetwater and Madisonville, had failed to attract a significant number of manufacturing firms. Several persons interviewed stated that Monroe County has a history of labor violence and that this has had a detrimental effect in recruiting manufacturing firms to the county. Furthermore, changes in local government leadership resulted in management inconsistencies in both parks.

The rate of industrial park occupancy also varied with the type of sponsor. Parks sponsored by local governments had an occupancy rate of 44 percent, railroad and joint sponsorship, 69 percent, private citizen groups, 73 percent, and real estate, 77 percent. Real estate and railroad sponsors were confined to Chattanooga and Knoxville where demand for industrial land was high. The high rate of occupancy for private citizen sponsored parks was related to the early dates of establishment of the parks and to the effective leadership by the sponsors in attracting manufacturing, particularly since most of these parks were located in small communities. Parks sponsored by local governments were the youngest in the study area. Furthermore, these parks were established as long-range development projects rather than for profit on the sale of land.

CONCLUSIONS. The experiences of communities where industrial parks have been developed indicate that industrial parks programs are achieving the objectives of their sponsors, either that of profit from sale of land and rail freight revenue or attraction of industry to employ surplus labor. In general, east Tennessee industrial parks were substantially occupied. Parks sponsored by profit motivated groups in large cities achieved a higher percentage of occupancy than parks sponsored by community groups in small towns. Occupancy rates were highest in the oldest parks. The older parks, in turn, were found in large cities where there is a larger demand for industrial land than in small communities. In small towns, parks tended to be large and of recent establishment, but they were often handicapped by unimaginative leadership and the absence of elements which are attractive to manufacturing firms. Some small communities of 2,500 population or below had successfully established parks, but these parks had factors of exceptional leadership and locational advantages.

In the race to attract manufacturing industry to small towns in east Tennessee, the availability of a plant site has often been a major factor in locational decisions of manufacturers. Industrial parks in eastern Tennessee have attracted industry into small towns because of previously developed sites and available services. Industrial parks in large communities also provide expansion space for growing companies already situated within the community. The existence of a park in a small town does not insure industrial development, especially where there are major deficiencies in markets, transportation, labor, utilities, and services. Actually, the success of an industrial park depends upon the same factors which determine any kind of industrial growth. Therefore, before engaging in industrial park development, a community must determine the

feasibility of industrial growth with regard to that community's advantages. Then development should begin only if a favorable degree of success can be predicted.

* * *

(1) Liston, Linda, "Proliferating Industrial Parks Spark Plant Location Revolution," *Industrial Development and Manufacturers Record*, Vol. 139, No. 7, March/April, 1970, p. 7.

(2) Boley, Robert E., *Industrial Districts Restudied*, Technical Bulletin No. 41, Urban Land Institute, Washington, 1961, p. 29.

(3) *Ibid.*, p. 13.

(4) *1970 Site Selection Handbook*, Conway Research, Inc., Atlanta, 1970.

(5) Waters, John B., Federal Co-Chairman, Appalachian Regional Commission, Washington, D. C., personal communication, May 4, 1969.

(6) Whitlatch, George I., *Industrial Districts—Their Planning and Development*, Georgia Institute of Technology, Atlanta, 1968, p. 6.

(7) *Ibid.*

(8) Hackett, Charles W., Jr., *An Analysis of Planned Industrial Districts*, University of Washington Bureau of Business Research, Seattle, 1956, pp. 14 and 47.

(9) The principal objective in developing parks sponsored by local government, private citizens groups, and joint sponsors was to attract manufacturing firms that would employ local surplus labor. In private citizens sponsored parks, however, a tendency toward attraction of manufacturing at any cost is absent. Private citizen groups were composed primarily of local businessmen. The wages generated through new plant development will eventually benefit the merchants, landlords, and service organizations of the community. Other reasons for the development of government sponsored parks were: (1) creation of taxable property, or broadening the tax base, (2) economies of scale achieved by providing utilities for manufacturing plants in a concentrated area as opposed to servicing them at scattered locations, (3) utilization of vacant land already owned by the local government (e.g., county farm), and (4) to cope with nuisances that manufacturing plants might create.

(10) The lack of real estate sponsored parks in Knoxville in 1969 could be the result of the presence of a local government sponsored park (Forks-of-the-River Industrial Park). This park would be in competition with potential real estate developers who could not sell land as cheaply as that offered by the local government sponsor. For example, average cost of land to prospective firms in the Forks-of-the-River Industrial Park was $3,000 per acre compared with prices ranging from $8,000 to $20,000 per acre in the real estate sponsored parks in Chattanooga.

(11) As the central city plant sites lose their viability due to congestion and other factors, firms cannot completely detach themselves from the Chattanooga market area because markets, transportation, labor supply, capital, and other linkages are firmly established. Available industrial land in the parks provides suitable locations for some firms desiring to remain in the area.

(12) Several of the firms in the park, relocated from Johnson City, were wholesale outlets utilizing rail primarily for the receipt and shipment of goods.

(13) It was argued that industrial parks were serving their purpose because they gave evidence to prospective manufacturers of a favorable community attitude toward industrialization. For example, a firm that did not wish to locate in an industrial park, having been impressed with community attitude, might choose to develop its own site in the community.

(14) Between 1960 and 1970, only one industrial firm located in Marion County, one in Sequatchie County, and only four in Meigs County.

THE DALTON, GEORGIA, TUFTED TEXTILE CONCENTRATION

*John R. McGregor and Robert H. Maxey**

INTRODUCTION. The tufted textile industry in the United States exhibits an exceptional degree of spatial concentration. Approximately 62 percent of the domestic value of tufted products is produced within 50 miles of the small city of Dalton, an industrial community in northwestern Georgia (Figure 1), and fully half of the national tufted textile output is produced within the immediate Dalton area. *(1)* With the 1971 tufted textile value of shipments at approximately $2.1 billion, *(2)* the industry is clearly substantial. An analysis of the basis of this industry's long-term concentration in northwestern Georgia, therefore, deals with a large proportion of a significant domestic industry. Further, analysis of the factors involved in the origin of the industry in the Dalton area and in the area's continued dominance of the tufted textile industry represents a case study of the agglomeration process which should be of interest to those concerned with location theory.

DATA COLLECTION. Information on the development of the Dalton area tufted textile industry and the location factors which are significant to the industry proved to be available only from area sources. During 1968 and 1969, field interviews were completed at a stratified sample of 63 of the 106 area establishments found to be either directly engaged in tufted textile manufacture or linked to area tufted textile establishments (Table 1).

THE ORIGIN AND DEVELOPMENT OF THE DALTON AREA INDUSTRY. The first Dalton tufted textile product was made in 1895 when a local girl, Catherine Evans, produced a tufted bedspread by copying a style of needlework from a family heirloom. *(3)* Tufting had apparently been practiced in New England as early as 1790 and the technique had subsequently spread to Southern plantations. However, tufted textile production effectively ended with the onset of the "War Between the States" and was not reestablished until the technique was once again used in the Dalton area.

Although tufted products were initially made only for home use and not for sale, a commercial demand soon began to develop for the tufted spreads. The first known sale of a spread was in 1900 by Miss Evans, who shortly afterwards began to receive more orders than she could fill. She then arranged for other Dalton residents to begin tufting spreads in their homes to meet the demand and the cottage phase of

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the modern industry was begun. Soon men, women, and children were tufting spreads, first as a means of supplementary income and later as the prime source of family income.

The arrangements were simple; yarn and sheeting were delivered to the workers and, after payment for completed work, the tufted spreads were collected. Both laundering and dyeing of the spreads was done in the local homes, but a final laundering was done in Miss Evans' Dalton plant before the products were packed and shipped to the purchasers.

As demand grew, other tufted textile companies were formed and labor needs soon exceeded the Dalton supply. It became necessary to utilize the labor available in outlying communities; the automobile quickly began to be important to the growing industry. During the 1930

TABLE 1

MAJOR ESTABLISHMENTS WITHIN THE DALTON, GEORGIA TUFTED TEXTILE INDUSTRY COMPLEX 1968*

Industrial Subgroups	Number of Establishments	Number of Employees
226 Dyeing & Finishing Textiles	5	620
227 Floor Covering Mills	63	6,759
228 Yarn & Thread Mills	2	144
238 Misc. Apparel & Accessories	1	180
265 Paperboard Containers & Boxes	1	12
278 Bookbinding & Related Work	2	35
281 Industrial Inorganic & Organic Chemicals	3	48
306 Fabricated Rubber Products, NEC	15	560
307 Miscellaneous Plastics Products	2	32
355 Special Industry Machinery	12	433
TOTAL	106	8,823

*Subgroups found to be only incidentally linked to the tufted textile subgroups were excluded.
Source: data collected by the authors.

peak of the cottage industry phase of production, "haulers" provided the link between Dalton area plants and an estimated 10,000 people producing tufted textile products in their homes in north Georgia, eastern Alabama, and southern Tennessee. *(4)*

This peak foreshadowed a basic change from a cottage industry to a modern tufted textile industry involving large plants, mechanization, and a complex of industries linked to the tufted textile establishments. Experiments in mechanization resulted in the development of several

crude tufting machines between 1925 and 1930. The first efficient machines went into production in 1932. The term "chenille" came into use at this time to distinguish the machine produced or chenille spreads from the "candlewicked" or hand produced tufted spreads.

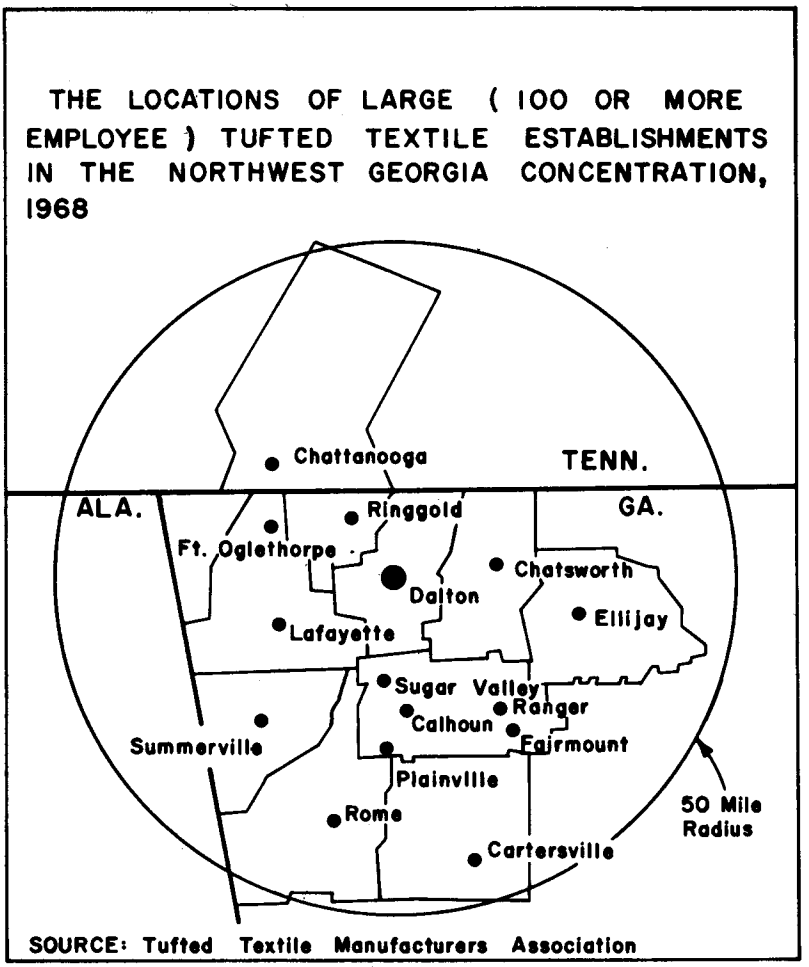

Figure 1

The move to mechanization was accelerated by the National Recovery Act Minimum Hourly Wage Law which established a minimum of 32.5 cents per hour as the minimum national wage in manufacturing.

Previously, the companies had been paying between five and ten cents an hour and with the substantially higher minimum wage requirements, hand tufting of the textiles was no longer profitable.

As the industry modernized, new machines were developed which expanded the variety of tufted textile products. Not only were tufted bedspreads produced, but tufted robes, housecoats, beachwear, stair runners, and rugs as well. With this diversification, the Dalton tufted textile industry experienced substantially increased market demands and expanded rapidly throughout the depression years. A machine was developed by 1940 which permitted production of a spread on a single pass; large scale operations in tufted textiles date from that time. *(5)*

Following production of military items during World War II, the tufted textile industry expanded rapidly to meet the backlog of demand for consumer tufted goods. It was not until 1950, however, that the Dalton tufted textile establishments began production of the tufted carpet (in contrast to cotton rugs). In that year, machines were introduced which could handle wide (12 foot) sheeting, and mass production of quality tufted carpets became feasible. With rapid subsequent local advances in machine design and recognition by the tufted textile industry management of the market potential of tufted carpets, carpets quickly became the dominant product and now represent 96 percent of the production of the domestic industry. *(6)* The resulting growth of the tufted textile industry is best indicated by the rise in value of shipments from $133 million in 1951 to $2,099 million in 1971. *(7)*

PRESENT LOCATION FACTORS. With the shift to large scale carpet production in the Dalton area, a specific set of location factors emerged as the critical factors for the successful operation of the area's tufted textile industry. Paramount among these is the existence of a complex of linked industries which either provide needed goods and services to the area carpet mills or (in a few instances) utilize by-products of the area mills.

Information was requested from the management of 63 of the 106 linked establishments concerning the nature of their company's material and service purchases from other area manufacturing establishments and their sales to other local manufacturers (i.e., their local manufacturing *linkages*). *(8)* In most instances, data were readily provided on each type of linkage and the number of local establishments which were involved. However, the value of the goods and services involved was not uniformly revealed and the analysis of the linkages was necessarily developed on the basis of the reported frequency of each type rather than their dollar values. *(9)* The results are summarized in Table 2.

Linkages of three of the subgroups are apparently incidental to the tufted textile complex. Finished cotton fabrics (Subgroup 221) are required in very limited quantities; locally produced tape and bias products

TABLE 2

INSTANCES OF LINKAGES RELATING TO DALTON AREA TUFTED TEXTILE ESTABLISHMENTS, 1968 (n=63)

Producing Industrial Subgroup*		Consuming Industrial Subgroup												
SIC Code	Title	221	224	226	227	228	238	239	265	278	281	306	355	Total
221	Broad Woven Fabric Mills, Cotton				2		1							3
224	Narrow Fabric . . . Mills				1									1
226	Dyeing & Finishing Textiles	5			12	3	4	2						26
227	Floor Covering Mills				58		4	1						63
228	Yarn & Thread Mills	2			49		2	1						54
238	Misc. Apparel & Accessories													0
239	Misc. Fabricated Textile Products				1		1							2
265	Paperboard Containers & Boxes				11									11
278	Bookbinding & Related Work				28									28
281	Industrial Inorganic & Organic Chemicals			8	14									22
306	Fabricated Rubber Products, NEC			7	19	1						2		29
307	Misc. Plastics Products				49	2								52
355	Special Industry Machinery	2		3	14	1		2						22
TOTAL		9	0	18	258	5	14	6	0	0	0	2	0	312

*Three-digit subgroups of the Standard Industrial Classification. Printing service linkages are omitted since no specialized printing services are required by the tufted textile establishments.

Source: compiled from data obtained through interviews by the authors.

(Subgroup 224) supply only a small proportion of the Dalton area demand for such items; and fabric samples (Subgroup 239) are required by only two area tufted textile establishments. In each case, local sales represent less than one percent of the output of the subgroups.

In contrast, the linkages involving dyeing and finishing services (Subgroup 226) represent a vital part of the industrial complex. While the larger carpet mills normally maintain finishing operations, the smaller mills typically utilize other area establishments for finishing services rather than develop the necessary on-site facilities. In reality, the instances of dyeing and finishing linkages are understated by the subgroup statistic since many of the linkages reported within Subgroup 227 (floor covering mills) involve dyeing and finishing operations. Some of the larger mills which maintain on-site finishing facilities also provide contract services to other Dalton area textile establishments.

Aside from dyeing and finishing services, linkages within Subgroup 227 involve a number of small companies which buy damaged carpets from the major carpet producers. The carpets are recut to eliminate the damaged areas and then marked as first quality products.

The purchase of cotton yarns from local mills (Subgroup 228) by the tufted textile establishments is also a common linkage. Synthetic fibers production, however, has not been attracted to the Dalton area despite the large demand for synthetic yarns. A few suppliers have located offices with the northwest Georgia industry concentration, but synthetic yarns are still obtained from sources located outside the immediate region.

Paper-product rug cores (Subgroup 265) are obtained from local manufacturers as are "bookbinding" services (Subgroup 278) needed for the production of carpet sample binders. Samples of each carpet mill are supplied to retailers throughout the market area. Demand for such services is substantial.

Dyes for finishing (Subgroup 281), latex (Subgroup 306) used for carpet backing, and polyethylene bags (Subgroup 307) for packaging are also obtained from local producers. In dye and latex production, exact product characteristics are required and close collaboration of the producer and consumer has been necessary to assure receipt of usable materials. Their spatial proximity, therefore, has been important to the area tufted textile establishments.

The close areal association of the tufted textile producers and the manufacturers of tufting machinery (Subgroup 335) in Dalton has historically been a major factor in the local development of the tufted textile industry. The rapid improvement in machine design is best suggested by the claim of one local manufacturer (doubtless exaggerated) to have never produced two identical tufting machines. Product quality and production costs have both benefited from such improvements. The shift from spread and robe production to carpets was made possible by

new machines designed within the Dalton area. Under such conditions, the need for ready technical and administrative communication between the personnel of the related industries is continuous. Satisfaction of this demand is greatly facilitated by the close areal association of the industries involved.

The most significant linkages clearly include those based on local dyeing and finishing services and the local manufacture of dyes, latex, and machinery used by the tufted textile industry. While the remaining linkages do represent definite material cost or service advantages, the loss of local sources of cotton yarn, paper rug cores, polyethylene bags, or bookbinding services would have a comparatively modest cost impact on the area tufted textile establishments. These items and services could be obtained from sources outside the Dalton area (most probably in Atlanta or Chattanooga) without major additional transportation charges and with relatively limited service problems.

In contrast, the loss of area dyeing and finishing services would be a major problem for many of the local tufted textile establishments. The availability of such services has been particularly vital to producers in their early, small scale stage of operations. Not only are their initial capital needs reduced, but the inefficient use of such facilities within a small scale establishment is avoided. Since comparable industrial services would not be available in most other industrial areas, the dyeing and finishing services within the Dalton area have been and remain an important factor in the rapid development of the tufted textile industry in northwest Georgia.

The availability of locally produced dyes, latex, and production machinery also represents significant operating advantages for the tufted textile producers. Both dyestuff and latex characteristics must be exact; variations in their formulation can render such products unacceptable for use. Therefore, it is advantageous for the fabricators of such materials to be close to their market. Proximity, with its opportunity for direct communications between producer and consumer, can reduce the problems of rapidly identifying and correcting product deficiencies, minimize the time needed for replacement of defective supplies, and, in turn, reduce the chance of costly production delays in the consuming tufted textile establishments.

Similar operating advantages for the textile producers result from their proximity to their machinery suppliers. As already indicated, the design of machinery for the tufted textile industry has progressed very rapidly in recent decades and this program has been heavily dependent upon the close collaboration of the machinery manufacturers and the tufted textile establishments. Most of the innovations in tufted textile industry machinery have been designed in the Dalton area. Thus, the area tufted textile operations have benefited (and apparently will con-

tinue to benefit) from what approximates an industrial service in machine design and which is uniquely available in the Dalton area.

This complex of linked industries supplying goods and services represents an important locational advantage for the Dalton area tufted textile establishments. A comparable group of supporting industries would not be replicated elsewhere. *(10)*

OTHER LOCATIONAL FACTORS. In addition to linkages, a number of other factors were found to be significant to the location of tufted textile establishments in and around Dalton. *(11)* The more important of these include intake and waste water treatment, plant sites, labor, materials, and marketing. The impact of each factor is considered in turn.

The provision of much of the necessary treatment of intake water at municipal facilities is a present advantage for the Dalton establishments. Not only are water softness and pH maintained at acceptable levels for dyeing, finishing, and laundering operations, but impurities such as iron and manganese (which could damage textile products) are specifically controlled. Further, municipal sewage treatment at Dalton is designed to remove most of the wastes generated by the tufted textile industry. *(12)* At locations where comparable municipal water treatment facilities are lacking, tufted textile establishments would necessarily have to provide substantial on-site water treatment facilities. This would raise the "plant and equipment" costs of such firms.

Industrial land costs in the Dalton area are reaching levels of $80,000 per acre and are substantially higher than the cost of comparable sites elsewhere in northwest Georgia. *(13)* Since carpet mills require considerable space, the relatively high land costs in Dalton are significant and are apparently becoming a limiting factor in the local growth of the industry.

Labor, although highly skilled in tufted textile manufacture, has been in short supply locally for a decade because of the rapid growth of carpet mill employment. Despite increased commuting of workers to Dalton, competition for the available skilled labor remains intense. The limited labor supply may also inhibit further local growth of the industry.

The major material costs of the tufted textile establishments primarily involve backing fibers (largely jute) and various fibers used for carpet piles. Of the latter, nylon represents 48 percent of the cost, wool 24 percent, acrylic fibers 17 percent, and all other fibers 11 percent. *(14)* Obviously, no single fiber dominates material costs and none has attracted the tufted carpet industry to its production location. Conversely, except for cotton yarn, the demand for the required fibers has not yet reached the point that their production has developed in the Dalton area.

Of the materials not supplied by Dalton manufacturers, only jute is obtained from sources outside the southeastern United States. Although the Dalton mills have no clear advantage over most alternative locations

in the Southeast for accumulating materials, material costs are apparently competitive with those of other tufted textile manufacturers in the region. However, there is a definite materials cost advantage for Southern producers and, with the increasing possibility of synthetic fiber carpet backing, the regional materials cost advantage may soon be further increased.

The market for Dalton area tufted textile products is now clearly national, even though sales were found to be greatest in the Northeast and Midwest (Figure 2 and Table 3). *(15)* The concentration of sales in

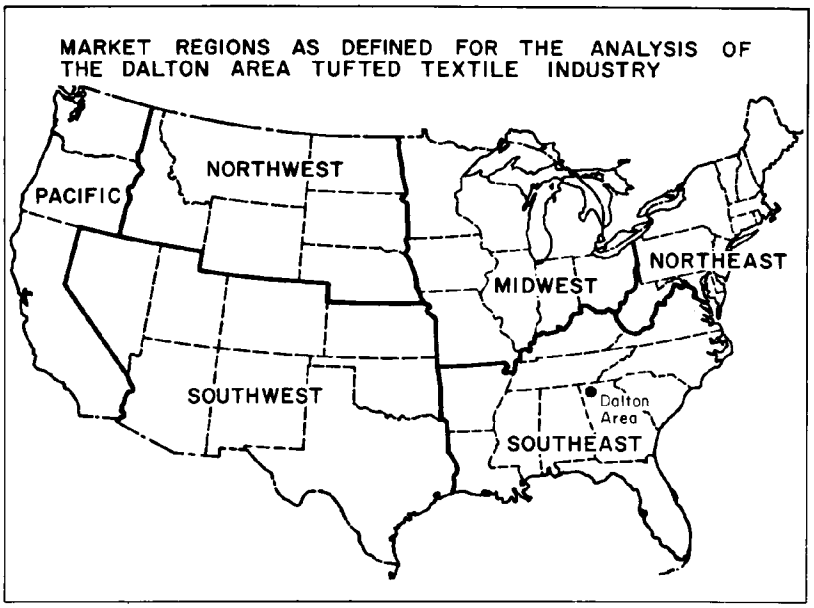

Figure 2

these two regions (53 percent of the total) suggests that a location within the northeastern part of the country might offer faster overall service and relatively low marketing costs compared to those at a Dalton location. The loss of proximity to Southern markets would be more than compensated for by the reduced costs and greater speed in serving consumers in the Northeast and Midwest. Further, if a midwestern location was selected, the costs and delivery time in serving the western regions would not necessarily be higher than at a Dalton location.

Dalton producers now ship their products in company trucks which makes possible overnight delivery to most Midwestern and Northeastern consumers. While not offsetting the higher costs of serving the national market from a Southeastern location (versus one in the Midwest or

Northeast), company-owned trucking has apparently reduced the service disadvantages of a Dalton location in supplying markets in the Midwest or Northeast and been significant in maintaining the competitiveness of the Dalton mills in marketing within those regions.

TABLE 3

PROPORTION OF DALTON AREA TUFTED TEXTILE SALES BY MARKET REGION, 1969

Market Region*	Percent of Total Sales
Northeast	28
Midwest	25
Northwest	2
Southeast	13
Southwest	11
Pacific	21

*Regional boundaries are delimited on Figure 2.
Source: calculated from data obtained through interviews by the authors.

TABLE 4

DISTRIBUTION OF TUFTED CARPET AND RUG MANUFACTURER CONCENTRATIONS, 1967 (INDUSTRY 2272)

Area*	Number of Establishments	Percent of Industry Establishments
Northwest Georgia	141	57.3
Western Carolinas	14	5.7
Middle Atlantic	15	6.1
Southern California	35	14.2
Other	41	16.6
TOTAL	246	99.9

*The areas are indicated on Figure 3.
Source: Census of Manufacturers, "Location of Manufacturing Plants by County, Industry, and Employment Size, 1967," special tabulation, unpublished.

OTHER TUFTED TEXTILE AREAS. Despite the substantial advantages of the Dalton-Northwest Georgia area for tufted textile production, some dispersal of the industry has occurred since its origin. The major development of the industry outside northwest Georgia has occurred in three areal concentrations (Figure 3 and Table 4). Only 41 of the 105

tufted textile establishments operating outside Dalton in 1967 (39 percent) were sited outside the smaller Western Carolinas, Middle Atlantic, and Southern California concentrations. While the location factors generating these concentrations could not be defined from the Dalton area research, the advantages of agglomeration for tufted textile establishments apparently persist even when such establishments are located outside the Dalton-Northwest Georgia area.

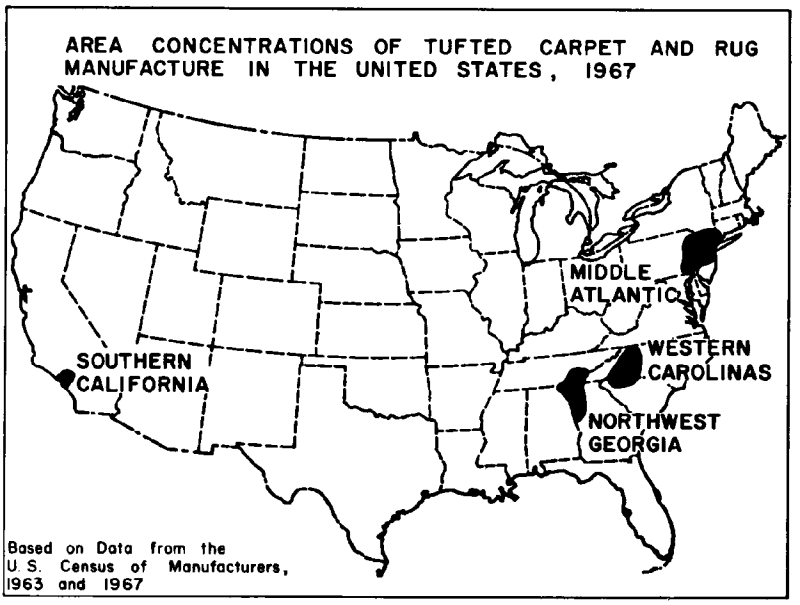
AREA CONCENTRATIONS OF TUFTED CARPET AND RUG MANUFACTURE IN THE UNITED STATES, 1967
MIDDLE ATLANTIC
WESTERN CAROLINAS
NORTHWEST GEORGIA
SOUTHERN CALIFORNIA
Based on Data from the U.S. Census of Manufacturers, 1963 and 1967

Figure 3

CONCLUSION. Within the Dalton area, tufted textile production has developed from a rediscovered handicraft to a cottage industry to a modern large scale factory industry. Despite its vast growth since 1950, it has remained concentrated in Dalton and in the surrounding communities of northwest Georgia. Its continued localization is based primarily on the twin factors of the industry's origin in Dalton and subsequent locational inertia resulting from the large investment in production facilities and certain agglomeration economies. *(16)* These economies, derived primarily from linkages with the complex of related manufacturing establishments in the area, are a major factor in this area's continuing dominance as a location for tufted textile establishments.

Other factors have, of course, been significant. Exceptional local management skills, a skilled labor pool in the area, local design of

required machinery, industry oriented municipal water treatment facilities in Dalton, and competitive material and marketing costs have all contributed to the area's locational advantage for the industry. The northwest Georgia dominance in the industry, therefore, is based on a diverse set of factors not fully replicated in any of the smaller industry concentrations (i.e., Western Carolina, Middle Atlantic, and Southern California). Until comparable operating advantages can be offered elsewhere or until labor shortages and land costs limit the industry's development in the area, the tufted textile industry should remain spatially concentrated in Dalton and Northwest Georgia.

* * *

(1) Georgia Department of Industry and Trade, *Whitfield County, Georgia, Economic Analysis Study, Part III*, Georgia Department of Industry and Trade, Atlanta, 1965, p. 1.

(2) Bureau of the Census, *Annual Survey of Manufacturers: 1971, Value of Product Shipments*, Government Printing Office, Washington, D. C., 1972, p. 8.

(3) *A Brief History of the Tufting Industry*, Tufted Textile Manufacturers Association, Dalton, Georgia, c. 1967, p. 1.

(4) As estimated by the Tufted Carpet and Rug Institute (formerly the Tufted Textile Manufacturers Association).

(5) *A Brief History . . ., op. cit.*, p. 3.

(6) Bureau of the Census, *1967 Census of Manufacturers, Volume II, Industry Statistics, Part I, Groups 20-24*, Government Printing Office, Washington, D. C., 1971, p. 22D-2.

(7) *TTMA Statistics*, Tufted Textile Manufacturers Association, Dalton, Georgia, 1966, p. 1; and Bureau of the Census, *Annual Survey of Manufacturers: 1971, . . ., op. cit.*

(8) The sample was developed to insure coverage of each type of industry involved in the complex. For each, interviewing was continued until the responses from additional establishments proved to identify no additional linkage types. It should be emphasized that complete coverage was unnecessary since linkage relationships could be identified by *either* the producer or consumer of the good or service. While some individual linkage *interactions* were no doubt missed, the sample was sufficient to identify the types of linkages relating to the area tufted textile industry and to provide a good indication of their local frequency of occurrence.

(9) While not ideal, the measure provides a reasonable comparative index of linkage magnitude.

(10) While some of the required goods and services could be provided by manufacturers at other areas, the combination of specialized dyestuff, latex, and machinery manufacture, dyeing and finishing services, and linkages involving goods and services of lesser importance to the industry, (i.e., required cotton yarn, packing items, and bookbinding services) is unique to the Dalton area.

(11) The identification and evaluation of the factors significant to the location of the tufted textile industry is largely based on the interview responses of the Dalton area manufacturers. The results seem to correspond with the reported magnitudes of the few industry costs which could be identified in the *1967 Census of Manufacturers* (Bureau of the Census, *op. cit.*, p. 22D-8).

(12) *Pure Water-Clean Effluent*, Allied Chemical Corporation, New York, c. 1967, p. 14.

(13) The statistic is based on values indicated by company representatives during the interviews.

(14) *TTMA, Statistics, op. cit.*, p. 14.

(15) An initial group of interviews demonstrated that the standardized regions of the census (geographic divisions or their combination in larger regions) were awkward for most respondents. The market regions shown in Figure 2 were then developed, following suggestions offered by marketing specialists in the Dalton mills. These regions were used successfully in subsequent interviews.

(16) For an extended discussion of the locational concept of agglomeration, see Alfred Weber, *Theory of the Location of Industries* (Translated by Carl J. Friedrich), The University of Chicago Press, Chicago, 1929, pp. 124-172.